

For Service Manuals Contact  
MAURITRON TECHNICAL SERVICES  
8 Cherry Tree Rd, Chinnor  
Oxon OX9 4QY  
Tel:- 01844-351694 Fax:- 01844-352554  
Email:- enquiries@mauritron.co.uk

# QUAD FM4 Tuner

service data

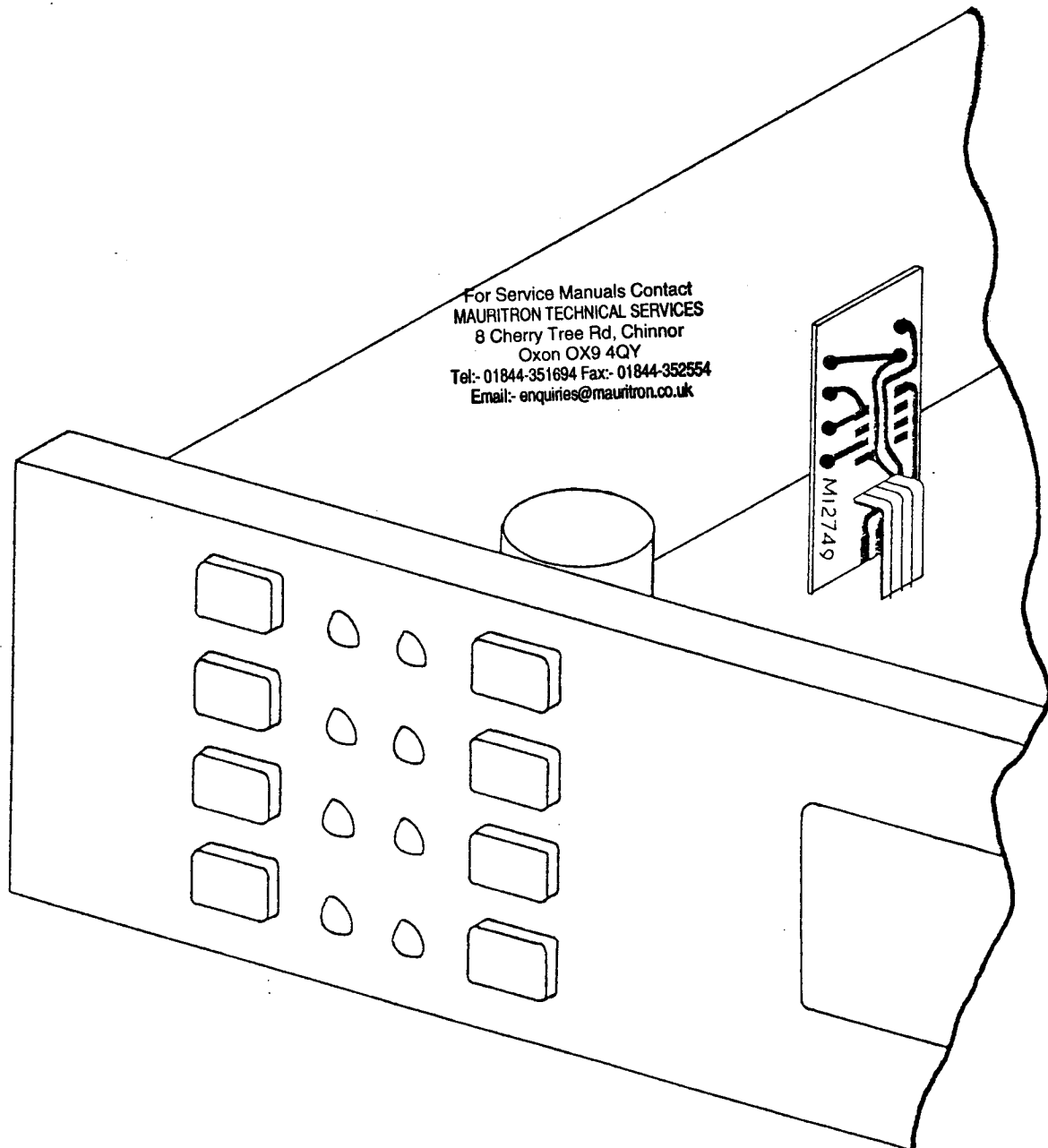
QUAD FM4

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The integrated circuit IC7 used as the IF amplifier in the FM4 has proved to be unreliable and has been replaced on later sets by a CA3053S.

We have developed a small printed circuit board incorporating a CA3053S which should be used as a replacement for the UA703.

The UA703 replacement can be ordered under stock number QF4IC7A.



February, 1983

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## introduction

The Quad FM4 is a self powered stereo tuner covering the FM band (88 - 108 MHz) only and designed to be used in conjunction with Quad and similar high quality pre-amplifiers.

The entire operation of the tuner is controlled by a microprocessor so that the only controls on the tuner are an on/off switch, tuning knob, and pre-selector buttons.

Up to seven stations can be stored in the tuner's memory and recalled at the touch of a button.

Manual tuning is accomplished in the normal manner in the sense that the tuning knob is turned clockwise to move up the frequency band and vice versa. The frequency tuned is displayed digitally and a bar graph gives simultaneous indication of signal strength and centre channel tuning.

## circuit description

### SIGNAL PATH

Input is transformer coupled to an earthed base RF stage in IC4, thence via a band pass filter (L4, L5) to a balanced mixer also in IC4 thence via L10/L11 to an IF amplifier (IC7) which drives a ceramic filter (F1, F2). Discriminator IC10 completes the IF chain. Pin 13 of IC10 provides a d.c. voltage proportional to signal strength, pin 5 is the muting facility driven by IC1 and pins 6 and 7 carry an AFC correction voltage.

Audio from pin 6 of IC10 is passed through a 'birdie filter' (C32, RV5, L16, C36) with RV5 serving as a channel separation control, and on to a phase locked loop stereo decoder IC17. Audio output from IC17 is then filtered by L17, L18 and buffered by T15 and T16.

T18, T19, T20 and T21 form a clamp circuit to suppress switch off and on 'thumps'.

### TUNING

Tuning is carried out by controlling the reverse voltage across varicap diodes within the tuned circuits. Tuning volts vary between two extremes, reference high and reference low which define the overall frequency range of the tuner. Ref. low is determined by the voltage across R23. This point is then buffered to pin 2 of IC5. Ref. high is fixed at 6.2V above ref. low by zener diode D24.

Ref. low hence ref. high will vary according to temperature and AFC correction. Temperature compensation is provided by T11 and R20. Fluctuations in temperature will vary the current through hence voltage across R23. Thus changing of the anchor point of the whole tuning range will compensate for temperature excited frequency drift of the tuned circuits. AFC compensation is carried out in much the same way but the correction current is derived from a separate circuit (see AFC).

Reference low volts are typically 2.0 on a hot day, making Ref. high 8.2V.

### STATION SELECTION

The heart of the selection system is IC1. This is a custom programmed microprocessor whose function is to manage the select buttons and remember pre-set stations.

Tune volts may be controlled by 1 of 2 sources – the tune pot or a pre-set station. Upon selection the microprocessor will enable the appropriate 2 of four analogue switches contained in IC6.

When **TUNE** is selected then tune volts will be derived from the wiper of the tune pot and the AFC is turned off.

When a pre-set station is selected then tune volts will be derived from a digital code stored in the microprocessor memory representing the required station and the AFC is turned on.

### Tune

Selection of **TUNE** initiates 2 separate actions.

- (i) Pin 23 of IC1 will carry a logic 'high' illuminating D20 via the appropriate transistor switch.
- (ii) Pin 12 of IC1 will also carry a logic 'high' enabling the two analogue switches to which it is connected. Under these conditions tune volts are controlled by the potentiometer RV4 via a buffer. The AFC correction circuit is bypassed.

### Preset Stations

Selection of a pre-set station initiates 3 separate actions.

- (i) The appropriate indicator LED is illuminated via a transistor switch.
- (ii) A 12 bit binary code representing a particular tune voltage is taken from the microprocessor memory and output in serial form on pin 11 of IC1. Pin 10 of IC1 clocks the data into the serial input parallel output shift registers (IC2 and IC3) from where it is converted to an analogue voltage by the R-2R D to A converter N2. The voltage is then fed to pin 1 of one of the analogue switches of IC6 via a buffer.
- (iii) Pin 13 of IC1 carries a logic high enabling two analogue switches. Tune volts are then set at the value on pin 1 of IC6 and AFC correction is applied to R23.

## STATION LOADING

Having first selected **TUNE** the microprocessor starts off in the 'Tune' mode. Pressing the required pre-set button simultaneously initiates a comparison process.

The microprocessor sets up a binary code which is converted to a voltage by N2. This voltage is then compared to the manually selected voltage on pin 8 of IC5. Differences between pins 7 and 8 of IC5 will be amplified by the comparator, the output of which is connected to pin 1 of the microprocessor. As long as there is a difference voltage on pin 1, the microprocessor will continue to output various binary codes using a successive approximation method. The binary code which gives no difference voltage between pins 7 and 8 of IC5 will be stored. The microprocessor will then switch into the pre-set mode, switching on the AFC.

## MUTING

During the execution of any selection commands, pin 14 of IC1 carries a short logic 'high' pulse. The 'high' is sustained by D25, C19, R17, R18 and applied to the muting pin on IC10.

## Other Microprocessor Functions

C10 forms half of a differentiator circuit. Upon switch-on a positive spike is applied to pin 28 of IC1 which initiates the microprocessor cycle.

Upon switch off, the transition of ref. high to zero volts is transmitted to pin 4 of IC1 via D23. This instructs the microprocessor to shut down. Memory however is preserved by volts applied to pin 26 from B1.

When the tuner is on, the battery is recharged through D22 and R12. D21 prevents ref. high from damaging the battery.

When the tuner is off, volts are applied to pin 24 from B1 via D21. Under these conditions D22 prevents further loading of the battery.

## FREQUENCY DISPLAY

Input to the frequency display system is derived from a loop situated close to the local oscillator. Hence a portion of local oscillator is fed via T10 and L9 to IC8 where the counting sequence begins.

The function of the display circuit is to subtract IF from local oscillator in order to extract tuned frequency. Tuned frequency should then be displayed and tracked. The complete process is repeated every 20mS, as shown below.

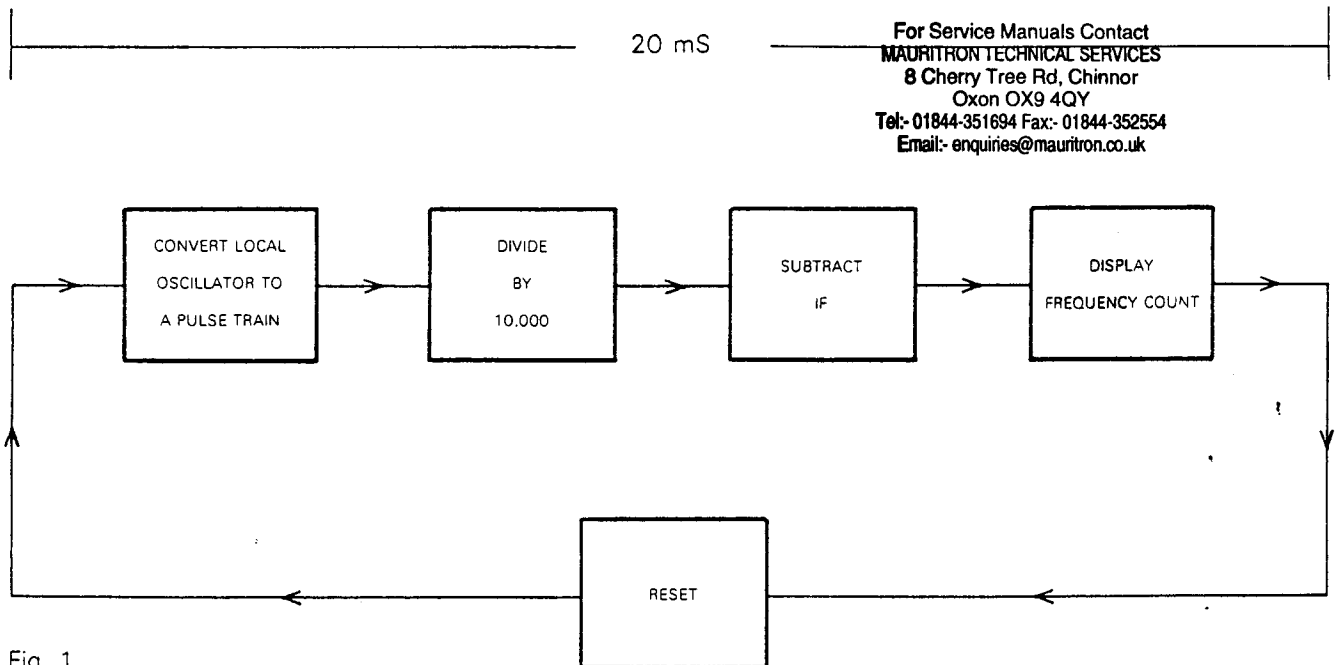


Fig. 1

For example if the tuned frequency were 90MHz:

Local oscillator = 90MHz + 10.7 MHz = 100700000Hz

Dividing by 10,000 = 10070Hz

Subtracting (IF ÷ 10,000) = 10070Hz - 1070Hz = 9000Hz

If the decimal point is now physically placed centrally, displayed frequency is then tuned frequency. Writing MHz after this merely acknowledges the overall divide by 1,000,000.

Timing of the cycle is controlled by a 50Hz clock produced by IC22 and associated components, at pin 2. The clock cycle may be regarded as two 10 mS parts, the positive half cycle during which counting is carried out and the negative half cycle during which displaying is carried out.

Ultimate counting is carried out by IC21. Using logic circuitry to control the enable state of this counter separates the counting half cycle from the display half cycle.

# QUAD FM4 Tuner service data

## Counting Half Cycle

The truth tables in Fig. 2 may assist in the understanding of the description below.

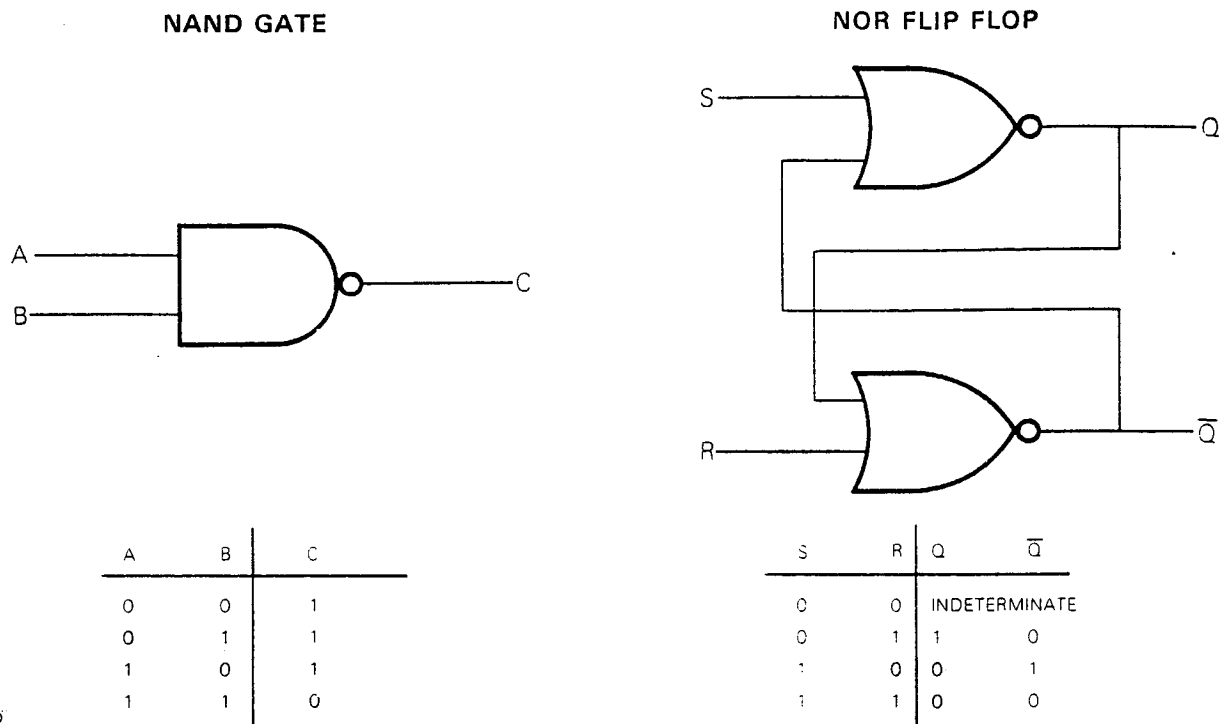


Fig. 2

A transition from logic zero to logic 1 of the clock, (pin 2 of IC22) initiates the cycle. This transition results in a positive spike being applied to pin 8 of IC11, via the differentiator formed by C29 and R32, Fig. 3(b). The spike will be converted to a very short negative going pulse at the output of the NAND gate, pin 10 of IC11. This is then inverted to a positive pulse on pin 11 of IC11. The pulse resets counter IC13 directly and counter IC21 via the NOR gate latch of IC16. IC21 will remain inhibited until the latch is again set.

The divide by 10,000 is carried out in the following stage. IC8 converts local oscillator input into a pulse train and divides this by 100. The pulse train is then raised to CMOS level by T12. This is inverted and applied to one half of a NAND gate, pin 5 of IC11. Data is only conveyed from the NAND gate when the other input, to which clock is applied, is positive. Consequently pin 4 of IC11 carries 10 mS bursts of the pulse train, Fig. 3(e). This data is applied to the input of IC21, which remains inhibited. The count over this 10 mS period is in cycles per 1/100 of a second which is a further divide by 100 making the overall dividing factor 10,000.

Subtraction of IF is carried out simply by delaying the start of the main counter IC21, until a number of pulses corresponding to IF have occurred. The number of pulses are  $IF \div 10,000$  which equals 1070. It is now simply necessary to detect when 1070 pulses have occurred since reset, after which the main counter may be enabled.

Immediately after reset IC13 proceeds to count the pulse train. The binary representation for 1070 is 10000101110. The five 1's of this pattern are grouped by the AND gate arrangement of IC15 such that when this pattern is set up and pin 3 of IC16 is also high, (latch in reset state), a set pulse will be applied to the latch which will switch, and enable main counter IC21, Fig. 3(f). Latch output timing is shown in Fig. 3(g). IC21 will continue counting until the end of the 10 mS period when the clock is on its negative half cycle and no more pulses appear at its input. The count is held for the next 10 mS.

### Display half cycle

The count held by IC21 is decoded by IC20. IC20 drives the seven segment digits of the display via IC18 and IC19, which raise the logic outputs to levels suitable for driving the display.

Counter IC21, also has a multiplexed output facility which controls the grids of the digits and symbols on the display. As the grid of each segment is enabled the appropriate seven segment code is applied. Grids of indicators, (stereo, MHz and signal strength ladder) are linked to the digit grids. The multiplexer scan rate is derived from pin 13 of IC13.

Stereo will only be illuminated when its grid is enabled and, there is a positive output on pin 7 of IC17 (decoder). Ladder segments are illuminated in accordance with data on the driver lines of N3, (see below), and when their grids are enabled.

During the positive half of the clock cycle when counting is carried out, the positive signal on pin 15 of IC21 disables the grid outputs leaving the display blanked.

On the negative half of the clock cycle counting ceases and the stored count on IC21 is multiplexed onto the display.

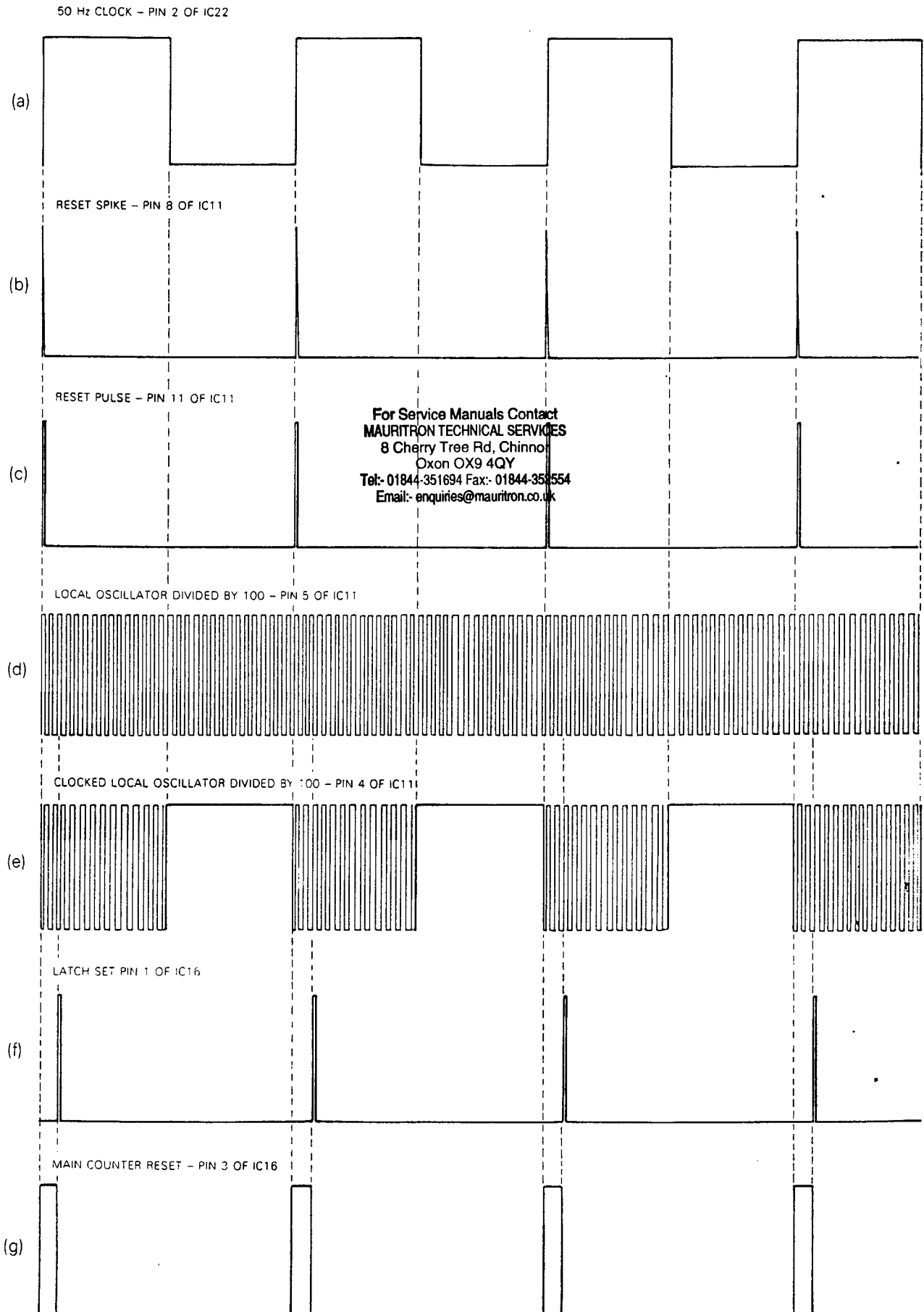


Fig. 3

## SIGNAL STRENGTH/CENTRE CHANNEL TUNING INDICATOR

When the FM4 is correctly tuned into a station there will be a dc voltage on pin 13 of IC10 which is proportional to signal strength. This is applied to the inverting input of the amplifier IC9.

Whilst IC9 is connected as a positive feedback amplifier, a further phase inversion within the feedback network itself makes the whole system behave as an amplifier with negative feedback.

Positive volts on pin 13 of IC10 are applied to pin 2 of IC9. This will cause a negative deviation of pin 6 of IC9 which will turn on some of the transistor driver devices of N3. As each device turns on, the appropriate segment on the signal strength ladder will illuminate and the current through hence volts across R33 and R34 will increase. When the volts across these resistors matches the volts on pin 2 of IC9, the output pin (6), will stop increasing hence no more devices will turn on.

Centre channel tuning information is derived from pins 6 (7 on pre-ISS 5 p.c.b.'s) and 10 of IC10. When on centre channel pins 6 and 10 are at the same dc offset, 5-6V. Pin 6 will fluctuate around this value according to the state of detune. Detune information is conveyed on the display by a shortening of one side of the signal strength ladder.

The grids of the two sides of the signal strength ladder, (left hand side and right hand side) are enabled alternatively by two of the multiplexed outputs of IC21. The same two points control the changeover switch formed by the analogue switches of IC12.

When pin 11 of IC21 is at logic high one side of the ladder will be illuminated and centre channel tuning data on pins 1, 8 and 4, 11 of IC12 will be transmitted to pins 3 and 2 respectively of the comparator in IC14. When pin 14 of IC21 is at logic high the other side of the ladder is illuminated and the data is forwarded to the comparator in reverse, i.e. data on pins 1, 8 is transmitted to pin 2 of the comparator and data on pins 4 and 11 is transmitted to pin 3 of the comparator.

The comparator output, pin 1, will normally be at 5.6V. When in a state of detune the potential difference across pins 6 and 10 of IC10 will cause the output of the comparator to deviate from its normal value. Deviation will be positive or negative for one half of the ladder and the opposite for the other half when the changeover switch operates.

Negative deviation of the comparator output will turn on and control the current through T13, hence changing the current through R34. Increased current through R34 will increase the volts on pin 3 of IC9. This will result in the extinguishing of a number of the signal strength segments proportional to the current passed through T13.

Positive deviation of the comparator output will have no effect on the signal strength segments. Hence the signal strength ladder is modified synchronously according to the state of detune.

## AFC

The AFC circuit operates on pre-set stations only. AFC is derived from pins 6 (7 on pre-ISS 5 p.c.b.'s) and 10 of IC10. Pin 10 is usually at 5.6V, whilst pin 6 will fluctuate around this value according to the state of detune. The potential difference across pins 6 and 10 is applied to the comparator of IC14. The comparator amplifies the difference voltage which, via a potential divider and an analogue switch, modifies the reference volts across R23. This will change reference low, thence tune volts.

When **TUNE** is selected the analogue switches of IC6 operate. Now the voltage drop across the potential divider is fixed at 5.6V, derived directly from pin 10 of IC10. Under these conditions AFC correction is bypassed and ref. low is defined.

# fault finding

Faults occurring on FM4's may be traced by using the flow diagram, see Fig. 4. The diagram is an effect(s) to cause guide based on common FM4 faults.

## USING THE FLOW DIAGRAM

The diagram assumes fault conditions only and ignores time intervals associated with time dependant faults.

The chain of ordered questions inside the bold markings are the diverging points of the eleven main branches. In most cases the significance of these markings should be ignored, as the diagram will automatically lead to the correct diagnosis. In cases where questions give rise to ambiguity the complete chain should be consulted. A question should emerge as being the most likely branching point. Failure to do so may result in the fault finder trying one or two different branches.

Exit from the diagram will usually be at one of the diagnoses, each of which is clearly defined below. In cases where the terminating statement is FINISH, refer to 'other faults'.

Where a faulty microprocessor (IC1) is diagnosed, removal and replacement of the microprocessor from its holder may cure the fault. The microprocessor is susceptible to static and other forms of interference the effects of which can sometimes be cured only in this way. The inexpensive test is always worth carrying out prior to purchasing a relatively expensive new microprocessor.

Replacement of IC4 will necessitate front end re-alignment as described on page 13.

## OTHER FAULTS

Faults which cannot be diagnosed by the flow diagram will be located by a more general approach.

Since much of the tuner is digitally controlled, voltages at many points in the circuit will be well defined for particular conditions. (see circuit description) hence simple voltage measurements may isolate faults. Following of the test procedure will further isolate faults.





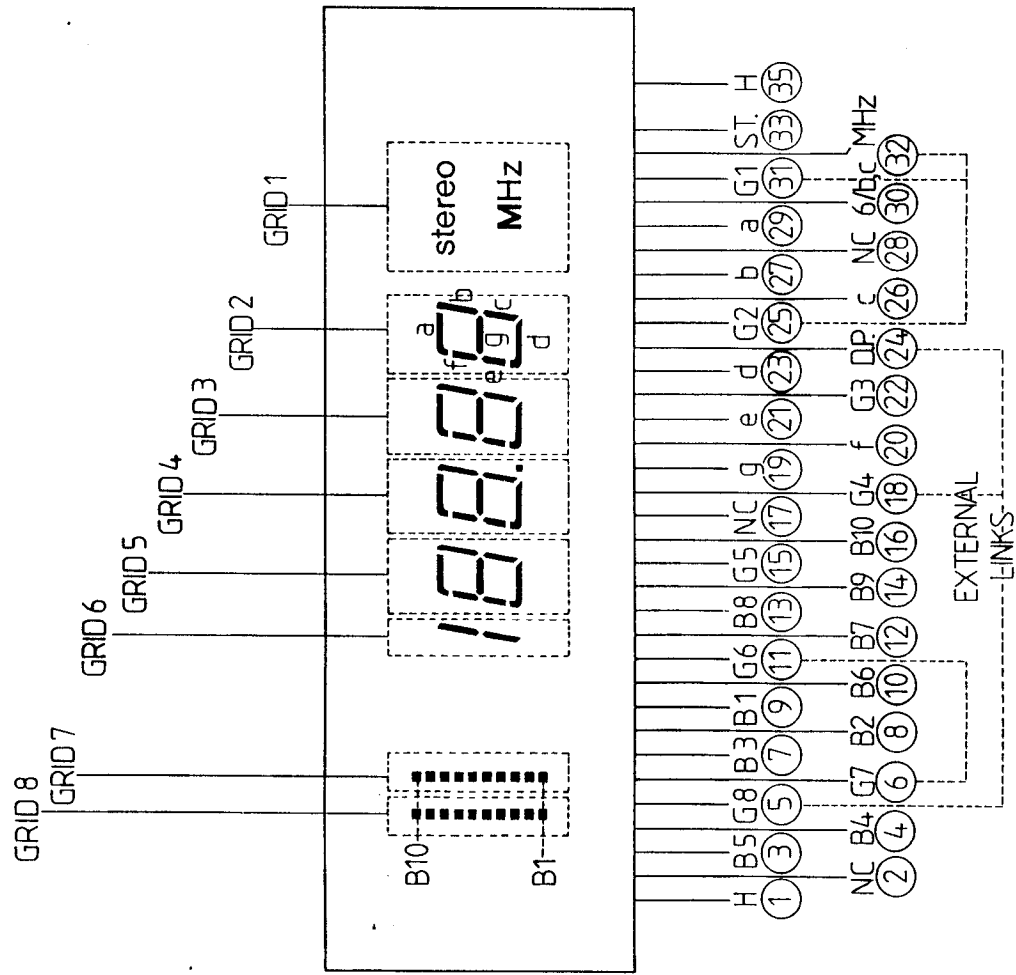


Fig. 4a

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## diagnoses

### DIAGNOSIS A

- (i) Intermittent short circuit on the primary side of the transformer.
- (ii) Fuse may have been blown by a spurious AC power supply spike.

### DIAGNOSIS B

- (i) Decoder is out of alignment. RV6 should be adjusted as in test 8.

### DIAGNOSIS C

- (i) Check wiring inside the power supply area.
- (ii) Dry joint on the transformer.
- (iii) O/C primary windings on the transformer.

### DIAGNOSIS D

- (i) Pin 15 of IC1 is not in the DIL holder. This means that the microprocessor is not dormant when the tuner is 'off' therefore loading the battery.

### DIAGNOSIS E

- (i) Battery drained. P.d. across the battery should be  $> 4$  volts.
- (ii) Battery not soldered.
- (iii) Battery broken.

### DIAGNOSIS F

- (i) R39 O/C.

### DIAGNOSIS G

- (i) IC1 holder contacts O/C.
- (ii) IC1 U/S.

### DIAGNOSIS H

- (i) Overall length of switch bar is too short. The cover should be removed (two screws). The switch bar should then be gently eased forward applying pressure at the kink. (Care should be taken not to damage the switch). The threaded nylon switch link can then be adjusted to increase the overall switch bar length. Replacement is a direct reverse of removal.

### DIAGNOSIS I

No supply to display.

- (i) Dry joint on the base of T22.
- (ii) Dry joint on display heater connections, pins 1 and 35.
- (iii) IC21 U/S.
- (iv) IC22 U/S.

### DIAGNOSIS J

- (i) IC7 U/S. Remove and replace with Quad replacement part QF4IC7A. (See page 18).
- (ii) IC4 O/C.

### DIAGNOSIS K

- (i) IC1 faulty.

### DIAGNOSIS L

- (i) Mechanical hum from rear of tuner due to a faulty transformer.

### DIAGNOSIS M

If the fault is with one LED only diagnosis is as in (i) or (ii). If no LEDs will light diagnosis is as in (ii) or (iii).

- (i) Indicator LED O/C.
- (ii) Dry joint on the selector board.
- (iii) Int. or faulty IC1.

### DIAGNOSIS N

- (i) T9 is getting too hot and dropping the HT volts from 12 to 6. Other typical symptoms are that the fault occurs after a period of time and may be temporarily cured by switching the tuner off, then on again. Cure will be to fit a heatsink to T9, it may also be necessary to replace T9 in order to accommodate the heatsink as the legs of fitted T9's may be too short. Bolt on heatsinks are available from Quad.  
Replacement parts: T9 Stock Number D7812XA, Heatsink Stock Number M12578A.

# QUAD FM4 Tuner service data

## DIAGNOSIS O

- (i) IC4 low gain.

## DIAGNOSIS P

- (i) Dry joint in display soldering (see Fig. 4a).

## DIAGNOSIS Q

- (i) IC4 S/C.

## DIAGNOSIS R

- (i) R52 O/C.

## DIAGNOSIS S

- (i) R53 O/C.

## DIAGNOSIS T

- (i) Transformer primaries S/C.

## DIAGNOSIS U

- (i) IC8 U/S.

Great care should be exercised when replacing IC8 to avoid contact with the device as it is highly susceptible to static.

- (ii) L9 O/C.

## DIAGNOSIS V

- (i) T11 U/S.

- (ii) D12 U/S.

- (iii) D24 U/S.

## DIAGNOSIS W

- (i) Tune pot loose. Remove the cover (2 screws) and adjust the tune pot locking nut.

- (ii) Tuning feels stiff. Remove the cover (2 screws) and adjust the shaft nut.

- (iii) No end stops. RV4 U/S, remove and replace.

## DIAGNOSIS X

- (i) RV4 O/C contact.

- (ii) Dry joint on ref. low or ref. high. Frequency will be fixed at the top or bottom of the band frequency respectively.

- (iii) IC1 U/S. Pin 12 should be logic high to operate the analogue switch.

- (iv) IC1 holder contacts intermittent.

## DIAGNOSIS Y

- (i) The whistles will be particularly noticeable on pre-loaded stations. Add C59, 47n as in tuner update 1J.

## DIAGNOSIS Z

- (i) R52 U/S.

## DIAGNOSIS (a)

- (i) R53 U/S.

## DIAGNOSIS (b)

- (i) RV4 U/S, track or contacts intermittent.

## DIAGNOSIS (d)

- (i) Re align tuner front end as in tests 2 and 6.

## DIAGNOSIS (e)

- (i) IC17 causing distortion.

- (ii) Check alignment.

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## testing and alignment

Complete testing and alignment may most easily be carried out using the test equipment listed below and interconnecting these units as shown in Fig. 5. Switches shown in Fig. 5 are a diagrammatical representation of various connections. In practice it is easier to connect leads together directly.

### TEST EQUIPMENT

Dual Beam Oscilloscope	AC Power Supply
Sound Technology 1000 (ST1000)	Pre-Amplifier
Digital Voltmeter	Power Amplifier
AC Microvoltmeter	Loudspeakers
10.7 MHz Oscillator	

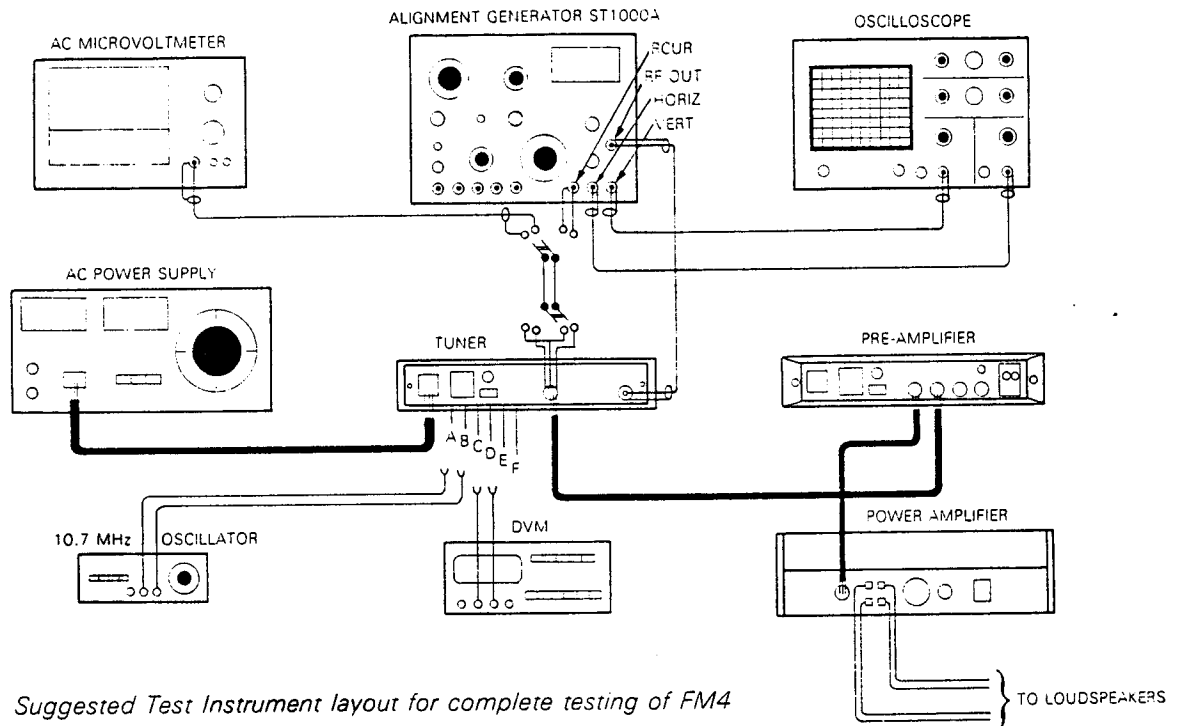
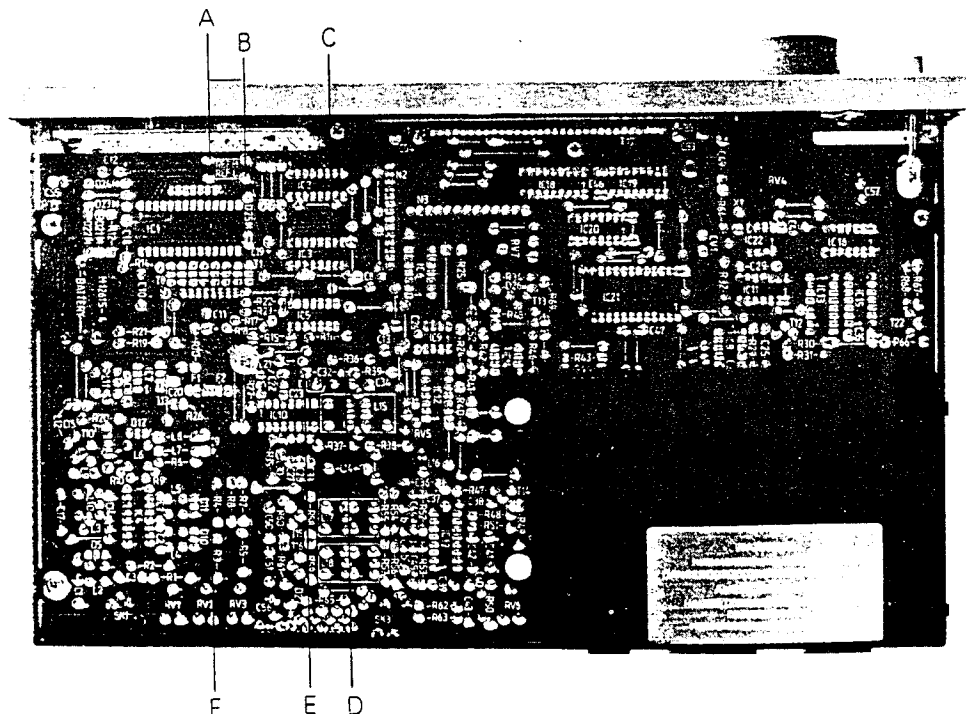


Fig. 5 Suggested Test Instrument layout for complete testing of FM4

Many of the tests involve making voltage measurements for which a digital voltmeter should be used. Solid bared wires should be soldered to the points shown below, making connections to the DVM easier.



# QUAD FM4 Tuner service data

## 1. POWER

### CONNECTIONS

AC supply power to tuner via variac

### CONTROLS

Variac: Zero  
Tuner: Power-on  
Voltage Selector -240V

Increase the output from the variac to 240V whilst observing the tuner current consumption which should not exceed 30mA. (typically 28mA). The gradual increase in supply volts will leave the microprocessor dormant hence no LED will light and the display will indicate approximately 87.5MHz. Switching off and then on again will initiate microprocessor action which will have minimal effect on the current consumption.

## 2. REGULATION

### CONNECTIONS

AC supply to tuner via variac

### CONTROLS

Variac: Output - zero  
Tuner: Power-on  
Voltage selector -110V

Increase the output of the variac to 135V. The tuner display should be functioning normally. Failure of the display to do so indicates that the regulator under overloaded input conditions has cut its output from 12 to 6V. This occurs with some regulators because the device is functioning on the limit of its temperature range. A temporary cure is to simply switch the tuner off and allow the regulator to cool down before turning on again. A more permanent cure is to fit a heatsink to the regulator. Such a heatsink is available from Quad. It may also be necessary to replace T9 in order to accommodate the heatsink as the legs of fitted T9's may be too short. Stock numbers of replacement parts are as follows: Regulator - D7812XA, Heatsink - M12578A. Fixing is with an M3 nut and bolt.

## 3. TUNE VOLTS

### CONNECTIONS

AC supply volts to tuner  
DVM to point A

### CONTROLS

Tuner: Power-on  
Voltage selector -240V  
DVM: Range - 0 to 10V

The voltmeter reading should be approximately 8.2V. Connect the DVM to point B where the reading should be approximately 2.0V. These are ref. high and ref. low values which define the tuning range. The values will fluctuate according to temperature but the difference should always be 6.2V.

## 4. TUNING RANGE

### CONNECTIONS

AC supply to tuner

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### CONTROLS

Tuner: Power-on  
Voltage selector -240V  
Station - **TUNE**

With the tune knob turned fully anti-clockwise the display reading should be 87.5MHz. Adjustment of L6 will vary this. Rotate the tune knob fully clockwise. The display should count in an orderly manner up to approximately 109MHz as the tune knob is rotated.

## 5. IF ALIGNMENT

### CONNECTIONS

AC supply to tuner  
10.7MHz oscillator to tuner point F

### CONTROLS

Tuner: Power-on  
Voltage selector -240V

- The signal strength ladder should indicate 'centre channel'. Adjustment of the left hand side core of L15 will optimise this.
- Disconnect the 10.7MHz oscillator. Adjust controls and make connections as follows.

### CONNECTIONS

Tuner left channel o/p to ST1000 RCVR  
ST1000 VERT to oscilloscope Y2  
ST1000 HORIZ to oscilloscope Y1  
ST1000 RF o/p to tuner

### CONTROLS

ST1000: Function - dual sweep  
Sweep width - 150KHz  
Frequency - 87.5MHz  
RF level - 600  $\mu$ V  
Oscilloscope: Timebase - XY  
Y1 sensitivity - 5V/cm  
Y2 sensitivity - 0.2V/cm  
Tuner: Station - **TUNE**  
Frequency - 87.5 MHz

# QUAD FM4 Tuner service data

Adjust the ST1000 frequency dial until the tuner signal strength ladder indicates 'centre-channel'. Adjust the right hand side core of L15 such that the oscilloscope trace is flat topped, as in Fig. 6. If necessary readjust L6 as in (4), then re-check.

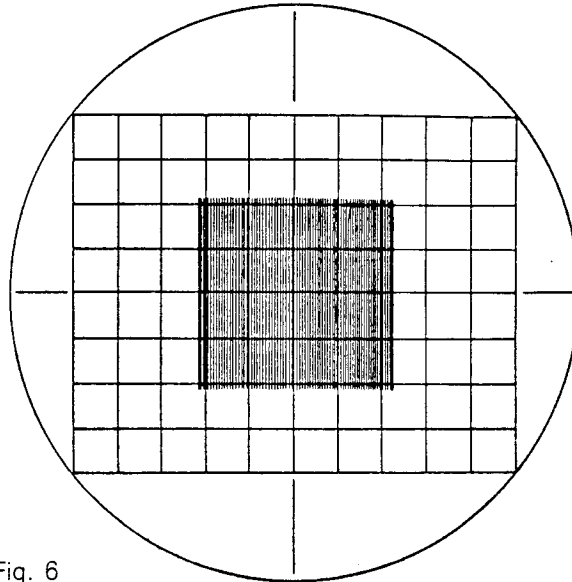


Fig. 6

## 6. RF ALIGNMENT

### CONNECTIONS

AC supply to tuner  
ST1000 RF o/p to tuner  
DVM to tuner point D

### CONTROLS

Tuner: Power-on  
Voltage selector -240V  
Station - TUNE  
Frequency -87.5MHz

ST1000: Function - mono  
Frequency -87.5MHz  
RF level - 100 $\mu$ V

DVM: Range - 0 to 10V

### CENTRE CHANNEL TUNING

Note the voltage reading at point D. Connect the DVM to point E and adjust the oscillator frequency until the voltage reading from E is the same as for D, correct to two decimal places. These are the AFC reference and correction volts and this ensures that the FM4 is on 'centre-channel'.

When on 'centre-channel' connect the DVM to point C on the tuner.

Adjust L2, L4 and L5 respectively to maximise the voltage reading. Tune tuner and ST1000 to 104MHz, again checking 'centre-channel' tuning by comparing AFC reference against AFC correction volts. Re-connect the DVM to point C and adjust RV1, RV2, RV3, L10 and L11 respectively, again for signal strength optimisation.

## 7. OUTPUT LEVEL

### CONNECTIONS

AC supply to tuner  
ST1000 RF o/p to tuner  
Output from tuner L/C to AC microvoltmeter

### CONTROLS

Tuner: Power-on  
Voltage selector -240V  
Frequency -87.5MHz  
Station - TUNE

ST1000: Function - mono  
Frequency -87.5MHz  
RF level - 1mV  
Modulation - 100%

AC Micro-voltmeter: Range - 0 to 500mV

Check for 'centre-channel' tuning as described in test 6. The output level reading on the AC microvoltmeter should be 280-330mV. Connect the R/C tuner output to the AC microvoltmeter and repeat the check. The two output levels should be matched within 0.5dB.

# QUAD FM4 Tuner service data

## 8. DECODER ALIGNMENT

### CONNECTIONS

AC supply to tuner  
ST1000 RF o/p to tuner

### CONTROLS

Tuner: Power-on  
Voltage selector -240V  
Frequency -87.5MHz  
Station - **TUNE**

ST1000: Function - stereo  
Frequency -87.5MHz  
RF level -1mV  
Modulation -100%  
Modulate -L/C  
Pilot level -10%

Observe the tuner display whilst adjusting RV6. Find the two extremes of travel on RV6 over which the decoder locks on to stereo and set RV6 approximately to the centre of these two extremes.

## 9. CROSSTALK

### CONNECTIONS

AC supply to tuner  
ST1000 RF o/p to tuner  
O/p from tuner L/C to AC microvoltmeter

### CONTROLS

Tuner: Power-on  
Voltage selector -240V  
Frequency -87.5MHz  
Station - **TUNE**

ST1000: Function - stereo  
Frequency -87.5MHz  
RF level -1mV  
Modulation -100%  
Modulate - L/C  
Pilot level -10%

AC Micro-voltmeter: Range - 0 to 500mV

Note the reading on the AC microvoltmeter which should be approximately 280-330mV. Switch the ST1000 to modulate the R/C. The output level should drop by at least 40dB. Connect the o/p from tuner R/C to the AC microvoltmeter and modulate the L/C. Again the reading on the meter should be 40dB down on full output. Crosstalk may be optimised by adjusting RV5.

## 10. SIGNAL TO NOISE

### CONNECTIONS

AC supply to tuner  
ST1000 RF o/p to tuner  
O/p from tuner L/C to AC microvoltmeter

### CONTROLS

Tuner: Power-on  
Voltage selector -240V  
Frequency -98MHz  
Station - **TUNE**

ST1000: Function - stereo  
Frequency -98MHz  
RF level -1mV  
Modulation -100%  
Modulate - L/C  
Pilot level -10%

AC Micro-voltmeter: Range - 0 to 500mV

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8 Cherry Tree Rd, Chinnor  
Oxon OX9 4QY  
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Email: enquiries@mauritron.co.uk

Check for on 'centre-channel' as described in test 6. Note the output level, then switch the ST1000 function switch to carrier wave. The output-level of the tuner should drop by 73dB. Reduce the ST1000 RF level to 1  $\mu$ V. The output level of the tuner should be 40dB down compared to full output.

Connect the right channel output from the tuner to the AC microvoltmeter and repeat the test.

## 11. FUNCTIONS

With the tuner connected into an audio system listen for any alien audibles. Check that the tuner will load and remember stations. Check that the tuner does not recognise station commands when it is switched off. This may be done by selecting a station say, **BBC1**, then switching the tuner off. Select a different station then switch the tuner on again. The tuner should revert to BBC1. Failure to do so would indicate that the battery is being overloaded. (See fault finding).



## modifications

### APRIL 1982

**Approx Serial Number 1630**

1. C58, 3.3pf stock number C3P30CA added. This improves the accuracy of the display counter circuit over the frequency band.
2. R24, R25 change from 2M2 to 4M7, stock number R4M70JA. This reduces the AFC range.
3. R29 changed from 220 $\Omega$  to 180 $\Omega$  stock number R180RJ1. Display counter circuit is now less temperature sensitive.
4. R33 changes from 1K5 to 1K2, stock number R1K20J1. This alters the maximum setting of the signal strength ladder.
5. D23 changes from IS920 to a green LED stock number BL86NA5. This prevents excessive loading of the battery.

### MAY 1982

**Approx Serial Number 2000**

Issue 3 printed circuit board introduced incorporating the following changes.

1. D27 and D28 stock number D1N4148 added to reduce distortion.
2. R69, 10K stock number R10K0J1 added. This improves the accuracy of the signal strength ladder.
3. The following components added: R66, 2K2 stock number R2K20J1, R67, 390R stock number R390RJ1, R68, 10R stock number R10R0J1, T22, ZTX450 stock number DZTX450, D29, VM18 stock number DVM18XX and C57 470 $\mu$ F stock number C470UZE.  
D6 and D7 removed. L1 secondary 1 turns increased. Transformer is now coded with a blue spot, stock number L12591B. These changes overcome display flicker particularly noticeable when used with 60Hz AC supply. Transformers fitted to ISS2 and ISS3 pcb's are not interchangeable.

### JUNE 1982

**Approx Serial Number 2500**

Issue 4 printed circuit board introduced incorporating the following changes.

1. C44a and C45a, 560p stock number C560PKJ added. This improves the de-emphasis.
2. R33, 1K2 replaced by RV7, 2K2 stock number RP2K20A.
3. Pin 9 of IC21 is now linked to pin 2. This prevents a visible ripple through effect on the display.
4. IC7, 703 changes to a 3053 stock number DCA3053. R70, 47K stock number R47K0J1 added in conjunction with this.  
This modification was carried out because 703's proved to be unreliable. Faulty 703's should be replaced with 3053's, however the pinning and biasing of the two devices is different. A small printed wiring board incorporating changes to overcome these differences is available and may be ordered as stock number QF4IC7A.

### Approx JULY 1982

**Approx Serial Number 3400**

1. L1 primary turns increased. The transformer now carries a red spot coding, stock number L12591B. Units fitted with earlier transformers were prone to losing regulation when AC supply volts were low.  
A heatsink is now fitted to the regulator device, T9.

### NOVEMBER 1982

**Approx Serial Number 5100**

C1 and C55, 47n removed. In some cases these devices gave rise to hum.

### FEBRUARY 1982

**Serial Number 6351**

Red tune button is now replaced by a brown button, stock number MBTUNEB.

### MARCH 1983

**Serial Number 6712**

C59, 47n stock number C47NOZL added. This overcomes whistles at particular frequencies.

### APRIL 1983

**Serial Number 7045**

N3 component board is now replaced by a thick film package, stock number QF4N3AC. The two are interchangeable.

# QUAD FM4 Tuner service data

## MAY 1983

Serial Number 7468

Between serial number 7468 and the introduction of ISS5 printed circuit board different methods to optimise the coupling of L6 were used.

Consequently when replacing L6 on tuners fitted with pre-ISS5 printed circuit boards it will usually be necessary to modify the printed display pick up loop, situated beneath L6.

To do this, first remove the two wire links connecting the printed loop to the underside of the pcb. With the new coil in place, a short length of wire should be looped once around the coil former. The wire ends should be crossed and soldered to the underside points of the holes vacated by the printed loop links.

## Approx DECEMBER 1983

Serial Number 11000

ISS 5 pcb introduced accommodating the following changes.

1. Wire links removed and replaced by copper tracks which are an integral part of the printed circuit board.
2. Following components added: R71, 10K stock number R10KOJ5; C61, 3p3 stock number C3P30CA; C62, 2 $\mu$ 2 stock number C2 $\mu$ 20KT; L20, 15.5 turns of W34TNAA; L21, 1 $\mu$ H stock number L4TIROM. Oscillator coil (L6) and Aerial coil (L2) are now screened, stock number N219101. R9 is now fitted to the rear side of the pcb and changes in value to 68 $\Omega$ , stock number R68ROKD. R1 changes in value to 10K, stock number R10KOJ5. R10, C9, C15, L7 and L8 removed. These changes overcome IF whistles at certain frequencies.
3. R72, 68K stock number R68KOJ1 and C63, 0.47 $\mu$ F stock number C47ONMP added. R39 and C31 removed. AFC is now derived from hence muted with audio.
4. C59 is now fitted to the top side of the pcb.
5. C60, 47n stock number C47NOZL added. This suppresses multiplexer noise.
6. Copper track around the AC supply area is modified resulting in re-positioning of the suppressor.
7. C1 re-instated.

## COMPONENT ALTERNATIVES

L1, mains transformer must always be of stock number L12591A on ISS 2 pcb's. These transformers have no colour coding.

From ISS 3 pcb onwards the mains transformer must be of stock number L12591B. These transformers may be coded with a blue or red spot. In cases where the AC supply volts are prone to dropping by considerable amounts red spot transformers should be used.

IC7 - see notes on page 18.

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Oxon OX9 4QY  
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## led and tune button update

Early tuners were fitted with a red tune button and comparatively large LEDS. Current tuners are fitted with a brown tune button and smaller LEDS in a plastic bezel. To update tuners with respect to these changes the following KIT should be ordered and instructions followed.

1. Disconnect the tuner.
2. Remove the cover (two screws).
3. Remove the tune knob, M3 grub screw.
4. Slacken off the screws securing the chassis to the tune bracket and the front of the pcb to the chassis.
5. Remove the six screws securing the front panel and slide the front panel free from the chassis.
6. Tilt the front panel forwards, giving access to the screws securing the button board and remove the screws. Pull the panel free from the button board and place it away from the working area.
7. Remove the buttons from the button board, noting their sequence.
8. Unsolder the existing LEDS. Extreme care should be taken to avoid lifting the copper track.
9. Solder the new pre-formed LEDS into the vacated holes, making sure that the red LED is in the correct place.
10. Refit the buttons with the brown tune button replacing the red one.
11. Fit the plastic bezel over the LEDS and refit the button board.
12. Replacement of the other components is a direct reverse of removal making sure to re-tighten the slackened screws.

KIT stock number QF4BEZA

## replacing IC7

On units prior to approximately serial number 2500 the device used as the IF amplifier, IC7, was a  $\mu$ A703. This device proved to be unreliable and from ISS 4 pcb onwards was replaced by a CA3053.

When replacing a  $\mu$ A703 with a CA3053 it is necessary to use a specially developed pcb which overcomes the differences in pinning and biasing of the two devices. The pcb simply solders into the existing holes in the orientation shown below. The pcb may be ordered as QF4IC7A.

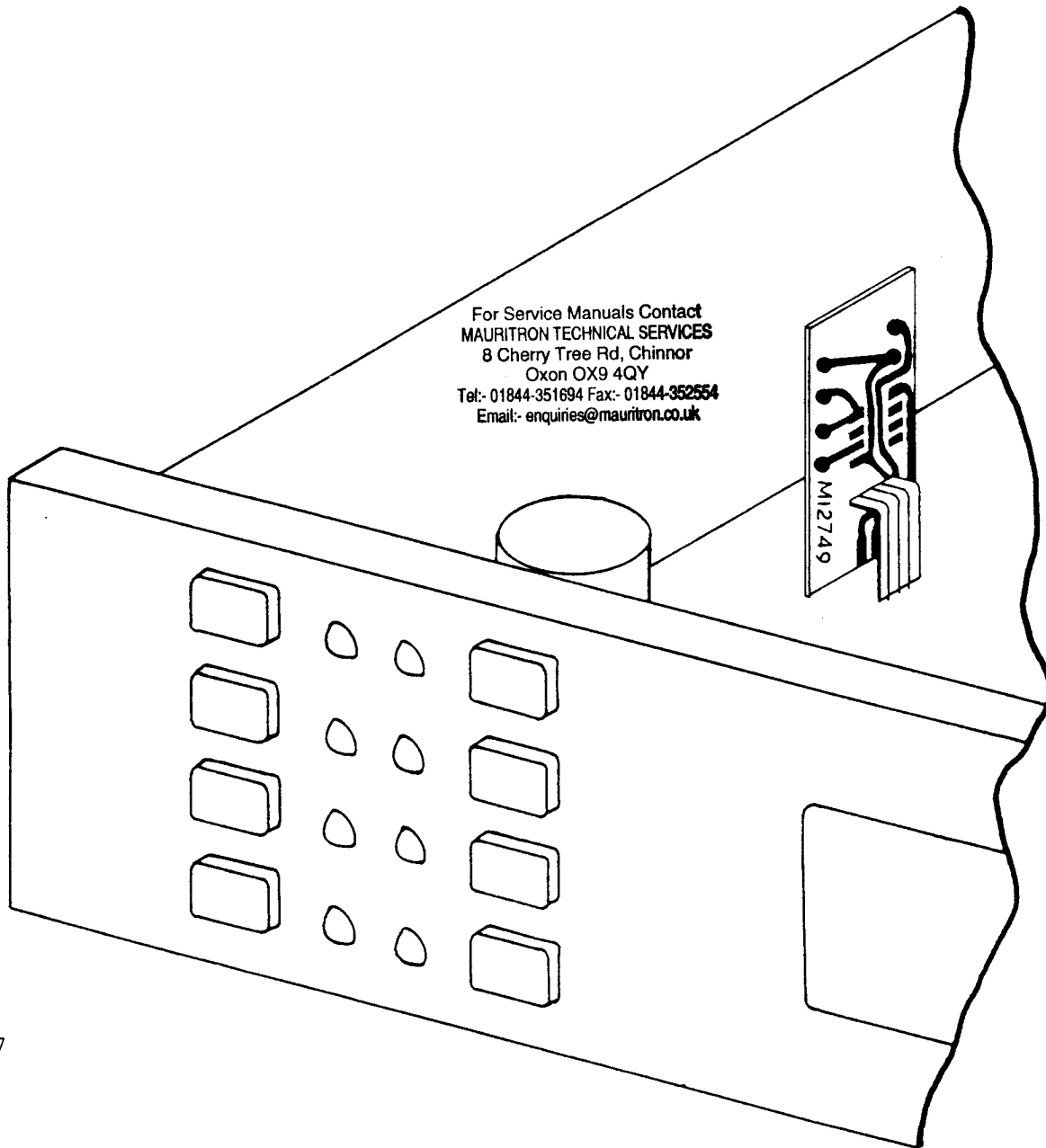


Fig. 7

# standard tuner update

## 1. UNITS BEFORE APPROX SERIAL NUMBER 1630

- (a) Add C58, 3.3p stock number C3P30CA. This should fit through the same holes and be soldered to the same pads as L9 alongside IC8.
- (b) Change the values of R24 and R25 from 2M2 to 4M7 stock number R4M70JA.
- (c) Change R29 from 220 $\Omega$  to 180 $\Omega$ , stock number R180RJ1.
- (d) Change R33 from 1K5 to 1K2, stock number R1K20J1.
- (e) Change D23 from IS920 to a green LED stock number BL86NA5. Also replace the battery stock number N4100DK.
- (f) Add R69 10K stock number R10K0J1. This should be fitted to the reverse side of the board between HT (12V) and the junction of D26 with the base of T13.
- (g) Add C44a and C45a 560p stock number C560PKJ. These should be soldered to the reverse side of the board and be parallel with R52 and R53 respectively.
- (h) Replace IC7,  $\mu$ A703 with replacement part QF4IC7A. (See page 18).
- (i) Remove C1 and C55.
- (j) Add C59, 47n stock number C47NOZL. This should be soldered to the reverse side of the board between pin 3 of IC5 and earth.

## 2. Units between Approx Serial Number 1630 and 2,000

Carry out modifications as in 1 (f), (g), (h), (i) and (j).

## 3. Units between Approx Serial Number 2,000 and 2,500

Carry out modifications as in 1 (g), (h), (i) and (j).

## 4. Units between Approx Serial Number 2,500 and 5100

Carry out modifications as in 1 (i) and (j).

## 5. Units between Approx. Serial Number 5100 and 6712

Carry out modifications as in 1 (j).

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Oxon OX9 4QY  
Tel: 01844-351694 Fax: 01844-352554  
Email: enquiries@mauritron.co.uk

The following parts list covers all of the parts currently necessary to produce an FM4 tuner. Previous issue values are indicated where current component values differ from those used on previous issue and are not interchangeable. Values which have changed for optimisation are not indicated but may be found under modifications, page 15.

Component Ref.	Present Value	Stock Number	Previous Value	Stock Number	Comments
R1	10K	R10K0J5	47K	R47K0J1	Changed at ISS 5
R2	1K5	R1K50J1			
R3	47K	R47K0J1			
R4	47K	R47K0J1			
R5	68K	R68K0J1			
R6	1K	R1K00J1			
R7	33K	R33K0FN			
R8	68K	R68K0FN			
R9	68R	R68R0KD	33R	R33R0KD	Changed at ISS 5
R10			33R	R33R0KD	Removed at ISS 5
R11					
R12	2K2	R2K20J1			
R13	270R	R270RJ1			
R14	15K	R15K0J1			
R15	100K	R100KJ1			
R16	2M2	R2M20J1			
R17	330K	R330KJ1			
R18	330K	R330KJ1			
R19	470K	R470KJ1			
R20	1K5	R1K50FN			
R21	470R	R470RJ1			
R22	150K	R150KFN			
R23	22K	R22K0FN			
R24	4M7	R4M70JA			
R25	4M7	R4M70JA			
R26	330R	R330RJ1			
R27	330R	R330RJ1			
R28					
R29	180R	R180RJ1			
R30	4K7	R4K70J1			
R31	220K	R220KJ1			
R32	10K	R10K0J1			
R33			1K2	R1K20J1	Removed at ISS 4
R34	1K	R1K00J1			
R35	33K	R33K0J1			
R36	4K7	R4K70J1			
R37	15K	R15K0J1			
R38	2K7	R2K70J1			
R39			15K	R15K0J1	Removed at ISS 5
R40	100K	R100KJ1			
R41	100K	R100KJ1			
R42	4M7	R4M70JA			
R43	33K	R33K0J1			
R44	33K	R33K0J1			
R45	3K3	R3K30J1			
R46	1M	R1M00J1			
R47	10K	R10K0J1			
R48	1K	R1K00J1			
R49	22R	R22R0J1			
R50	10K	R10K0J1			
R51	1K	R1K00J1			
R52	6K8	R6K80J1			
R53	6K8	R6K80J1			
R54	4K7	R4K70J1			
R55	47K	R47K0J1			
R56	47K	R47K0J1			
R57	4K7	R4K70J1			
R58	4K7	R4K70J1			
R59	4K7	R4K70J1			
R60	2K2	R2K20J1			
R61	2K2	R2K20J1			
R62	1M	R1M00J1			
R63	1M	R1M00J1			
R64	10M	R10M0KB			
R65	22K	R22K0J1			
R66	2K2	R2K20J1			
R67	390R	R390RK1			

# QUAD FM4 Tuner service data

Component Ref.	Present Value	Stock Number	Previous Value	Stock Number	Comments
R68	10R	R10R0J1			
R69	10K	R10K0J1			
R70	47K	R47K0J1			
R71	10K	R10K0K0			
R72	68K	R68K0J4			
RV1	100K	RP100KA			
RV2	100K	RP100KA			
RV3	100K	RP100KA			
RV4	50K	RVF4TUB			
RV5	10K	RP10K0W			
RV6	5K	RP5K00A			
RV7	2K2	RP2K20A			
C1	47n	C47NOZL			
C2	47n	C47NOZL			
C3	47n	C47NOZL			
C4	1000μ	C1K0UTA			
C5	1000μ	C1K0UTA			
C6	220μ	C220UZE			
C7	47n	C47NOZL			
C8	330p	C330PKI			
C9					
C10	1μ	C1U00KS	2μ2	C2U20KT	Removed at ISS 5
C11	100μ	C100UME			
C12	100μ	C100UME			
C13	47n	C47NOZL			
C14	47n	C47NOZL			
C15					
C16	180p	C180PKJ			
C17	330p	C330PKJ			
C18	47n	C47NOZL			
C19	1μ5	C1U50KT			
C20	47n	C47NOZL			
C21	47n	C47NOZL			
C22	47n	C47NOZL			
C23	47n	C47NOZL			
C24	47n	C47NOZL			
C25	330p	C330PKJ			
C26	330p	C330PK1			
C27	47n	C47NOZL			
C28	47n	C47NOZL			
C29	33p	C33POJJ			
C30	2μ2	C2U20KJ			
C31					
C32	47p	C47POKJ	2μ2	C2U20KJ	Removed at ISS 5
C33	47n	C47NOZL			
C34	100μ	C100UME			
C35	47n	C47NOZL			
C36	180p	C180PKJ			
C37	2μ2	C2U20KJ			
C38	220n	C220NKS			
C39	6n8	C6N80JA			
C40	47n	C47NOZL			
C41	470n	C470NKS			
C42	220n	C220NKS			
C43	220p	C220PKW			
C44b	6n8	C6N80JA			
C44a	560p	C560PKJ			
C45b	6n8	C6N80JA			
C45a	560p	C560PKJ			
C46	47n	C47NOZL			
C47	47n	C47NOZL			
C48	47n	C47NOZL			
C49	47p	C47POKJ			
C50	220n	C220NKS			
C51	220n	C220NKS			
C52	330n	C330NJS			
C53	47n	C47NOZL			
C54	47n	C47NOZL			
C55					
C56	22μ	C22U0ZE	47n	C47NOZL	
C57	470μ	C470UZE			
C58	3p3	C3P30CA			
C59	47n	C47NOZL			
C60	47n	C47NOZL			

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 8 Cherry Tree Rd, Chinnor  
 Oxon OX9 4QY  
**Tel:- 01844-351694 Fax:- 01844-352554**  
**Email:- enquiries@mauritron.co.uk**

# QUAD FM4 Tuner service data

Component Ref.	Present Value		Stock Number	Previous Value	Stock Number	Comments
C61	3p3		C3P30CA			
C62	2μ2		C2U20KT			
C63	470n		C470NLJ			
CV1	5/60p		CV60PTA			
L1	Mains Transformer		L12591B	Mains Transformer	L12591A	See alternatives page 16.
L2	Aerial Coil		L11160A			
L3	RF Matching Coil	15.5 turns of	W34TNAA			
L4	RF Coil		L11130A			
L5	RF Coil		L11129A			
L6	Osc. Coil		L11041A			See notes page 16.
L7				2μ2	LS1222K	Removed at ISS 5
L8				2μ2	LS1222K	
L9	Display Coupler		QF4L9AQ			
			ISHN65T			
			LB03131			
			WM110PB			
			WTM35AW			
L10	IF Xformer		L12606B			
L11	IF Xformer		L12606A			
L12	33UH		LS1333K			
L13	33UH		LS1333K			
L14	2μ2H		LS1222K			
L15	Discriminator		L12HF64			
L16	27mH		L10273J			
L17	Filter		LLPFS21			
L18	Filter		LLPFS21			
L19	33UH		LS1333K			
L20		15.5 turns of	W34TNAA			
L21	1μH		L4TIROM			
F1	Ceramic Filter		LSFE10R			
F2	Ceramic Filter		LSFE10R			
IC1	MP4480	Microprocessor	DMP4480			
IC2	4015	Shift Register	DCD4015			
IC3	4015	Shift Register	DCD4015			
IC4	1062	Front End	DDA1062			
IC5	094	Quad Comparator	DTL094X			
IC6	4066	Quad Transmission Gate	DCD4066			
IC7	3053	IF Amp	DCA3053	703	QF41C7A	See notes page 18.
IC8	8629	Pre-Scaler	DSP8629			
IC9	3140	OP Amp	DCA3140			
IC10	4441	IF/Discriminator	DKB4441			
IC11	4011	Quad Nand	DCD4011			
IC12	4066	Quad Transmission Gate	DCD4066			
IC13	4040	Binary Counter	DCD4040			
IC14	092	Dual Comparator	DTL092X			
IC15	4073	Triple Three Input AND Gate	DCD4073			
IC16	4001	Quad Nor	DCD4001			
IC17	4500	Stereo Decoder	D4500XA			
IC18	6128	Display Buffers	DN6128A			
IC19	6128	Display Buffers	DN6128A			
IC20	4543	Seven Segment Decoder	DEF4543			
IC21	4534	Counter	DEF4534			
IC22	706	Used to produce 50 Hz Clock	DM7068I			
D1	1N4148		D1N4148			
D2	1N4148		D1N4148			
D3	1N4148		D1N4148			
D4	1N4148		D1N4148			
D5	BB204		DBB204A			
D6				7V5 Zener	D887V5A	Removed at ISS 3
D7				7V5 Zener	D887V5A	
D8	VM18		DVM18XX			
D9	VM18		DVM18XX			
D10	BB204		DBB204A			
D11	BB204		DBB204A			
D12	BB204		DBB204A			
D13	86NA5		BL86NA5			
D14	86NA5		BL86NA5			
D15	86NA5		BL86NA5			

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**MAURITRON TECHNICAL SERVICES**  
 8 Cherry Tree Rd, Chinnor  
 Oxon OX9 4QY  
 Tel:- 01844-351694 Fax:- 01844-352554  
 Email:- enquiries@mauritron.co.uk



# QUAD FM4 Tuner service data

Component Ref.	Present Value	Stock Number
D16	86NA5	BL86NA5
D17	86NA5	BL86NA5
D18	86NA5	BL86NA5
D19	86NA5	BL86NA5
D20	85NA2	BL85NA2
D21	1N4148	D1N4148
D22	1N4148	D1N4148
D23	86NA5	BL86NA5
D24	1N823	D1N823X
D25	1N4148	D1N4148
D26	7V5 Zener	D887V5A
D27	1N4148	D1N4148
D28	1N4148	D1N4148
D29	VM18	DVM18XX
T1	BC183L	DBC183L
T2	BC183L	DBC183L
T3	BC183L	DBC183L
T4	BC183L	DBC183L
T5	BC183L	DBC183L
T6	BC183L	DBC183L
T7	BC183L	DBC183L
T8	BC183L	DBC183L
T9	7812 Regulator	D7812XA
T10	8F256A	DBF256A
T11	LM334Z	DLM334Z
T12	BC184	DBC184X
T13	BC214C	DBC214C
T14	BC214C	DBC214C
T15	BC214C	DBC214C
T16	BC214C	DBC214C
T17	Display	DISPLAY
T18	BC184	DBC184X
T19	BC214C	DBC214C
T20	BC184	DBC184X
T21	BC214C	DBC214C
T22	ZTX450	DZTX450
B1	Battery	N4100DK
N1	Suppressor	NPMR20A
N2	R-2R Ladder Network	QF4N2AQ
N3	Display Driver Network	QF4N3AC
FS1	Fuse 63mA 100mA for 110V Sets	UM63MDA
PL1	Mains Inlet Plug	PPR0331
SK1	Aerial Socket	PS01070
SK2	Mains Outlet Socket	PSR472A
SK3	Output Socket	PS05DNB
S1	Selector Switch	S44INPA
S2	Selector Switch	S44INPA
S3	Selector Switch	S44INPA
S4	Selector Switch	S44INPA
S5	Selector Switch	S44INPA
S6	Selector Switch	S44INPA
S7	Selector Switch	S44INPA
S8	Selector Switch	S44INPA
S9	Mains Power Switch	SF40FFA
S10	Voltage Selector Switch	SVL1869
X1	3.2768 MHz Crystal	NX3M276

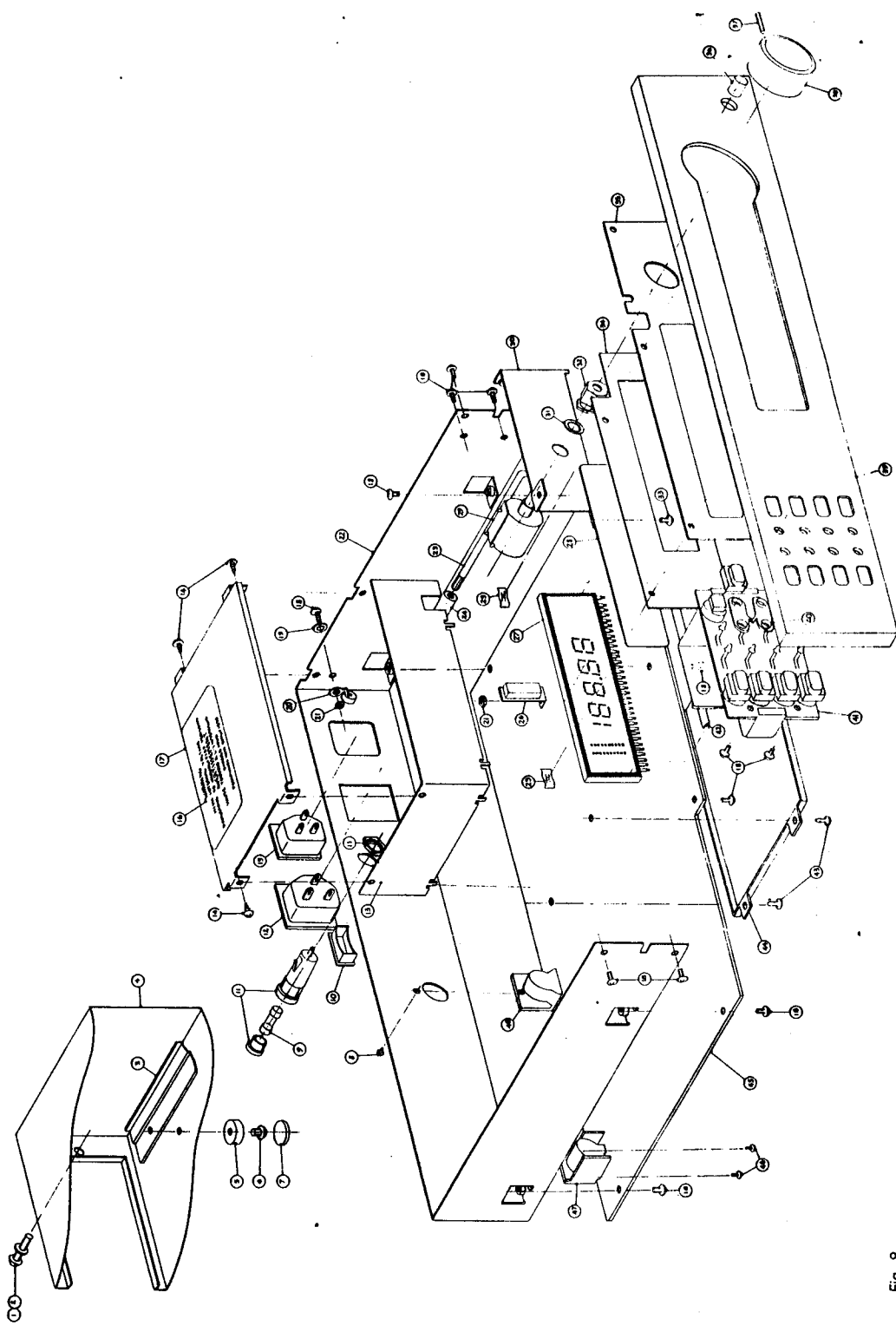
# QUAD FM4 Tuner service data

## Misc.

1.	Microprocessor DIL Holder		PI8528A
2.	Self Tappers for securing Aerial Socket	2	TC205PF
3.	Self Tappers for securing Output Socket	3	TC205PF
4.	Board Securing Screws M3x6mm	5	TM306PA
5.	Tune Pot Bracket Screws M3x6mm	3	TM306PA
6.	Front Panel Screws M3x6mm	4	TM306PA
7.	Button Board Screws M3x6mm	4	TM306PA
8.	Regulator Heatsink Screw M3x6mm	1	TM306PA
9.	Display Bracket Screw M3x6mm	1	TM306PA
10.	Board Screw M3x6mm	1	TM306PG
11.	Feet Screws M4x5mm	4	TM405PA
12.	Cover Screws M4x16mm	2	TM416PA
13.	Mains Cover PK Screws	4	TC406PC
14.	Tune Pot Grub Screw	1	TM316GC
15.	Cover Washers	2	TDM4SPA
16.	Regulator Heatsink Nut	1	TM3FHFA
17.	Tune Pot Washer	1	TD22010
18.	Display Bracket Nut	1	TM3FHFA
19.	Tune Pot Spindle Lock	1	N509816
20.	3 Way Ribbon between Tune Pot and Board	6cm	WRM603B
21.	7 Way Jumper Cable	12cm	M127117
22.	8 Way Jumper Cable	13cm	M127118
23.	Blue Wire	15cm	WM80136
24.	Green/Yellow Wire	10cm	WM8013E
25.	Brown Wire	15cm	WM80131
26.	Wire for Links		WL3922A
27.	PCB M12615 ISS 4		I12615C
28.	Button PCB M12614 ISS 2		I12614A
29.	Brown Rubber Strip	12cm	IGSMAAA
30.	Fuseholder		PF5234A
31.	Voltage Selector Shroud		M12579A
32.	Display Bracket		M12595A
33.	Display Bracket Sponge	2cm	IFVP6AA
34.	Display Perspex		M12576A
35.	Tune Bracket		M12569A
36.	Buttons		ILR1 MBILR1Y
			ILR2 MBILR2Y
			BBC1 MBBBC1Y
			BBC2 MBBBC2Y
			BBC3 MBBBC3Y
			BBC4 MBBBC4Y
			Tune MBTUNEB Red Tune Button MB TUNER
			BBCLR MBBBCLY
37.	Amber Filter		M12611A
38.	Push-on-Fix Clips	4	FF123ZF
39.	Front Panel		M12560A
40.	LED Bezel		MM12710
41.	On/Off Button		N36325A
42.	Switch Bar		M12593A
43.	Switch Coupling Link		N39159A
44.	Darvic Display Spacer		M12717A
45.	Black Tape for securing Amber Filter		IPMCSRA
46.	Cover		M12573A
47.	Cover Guides	2	M12562A
48.	Ultrasonic Noise Damper	2	IPEDAMA
49.	Feet Mouldings	4	M12620A
50.	Stick on Feet	4	AFNOSLA
51.	Mains Safety Cover		M12575A
52.	W Buttons	2	FP70271
53.	Transformer Cover		M12572A
54.	Tuning Knob		M12589A
55.	Caution Label		M12663A
56.	Mains Transformer Screen		M12571A
57.	Serial Number		M12621A
58.	Regulator Heatsink		M12578A
59.	Double Sided Sticky		IP55257
60.	Polystyrene Pack		ZX43F4A
61.	Carton		ZC43F4A
62.	Accessory Pack – Standard		QF4ACP1
63.	Instruction Manual		OIF42EC
64.	Polythene Bag		ZEF434A
65.	Chassis		M12568A
66.	Mains Earth Screw M3x6mm		TM306PA
67.	Mains Earth Nut M3		TM3FHFA
68.	Mains Earth Soldertag		FTB6SS5
69.	Mains Earth Shake Proof Washer		TDB6NLF
70.	Coil Screening Can	2	M219101

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# assembly diagram



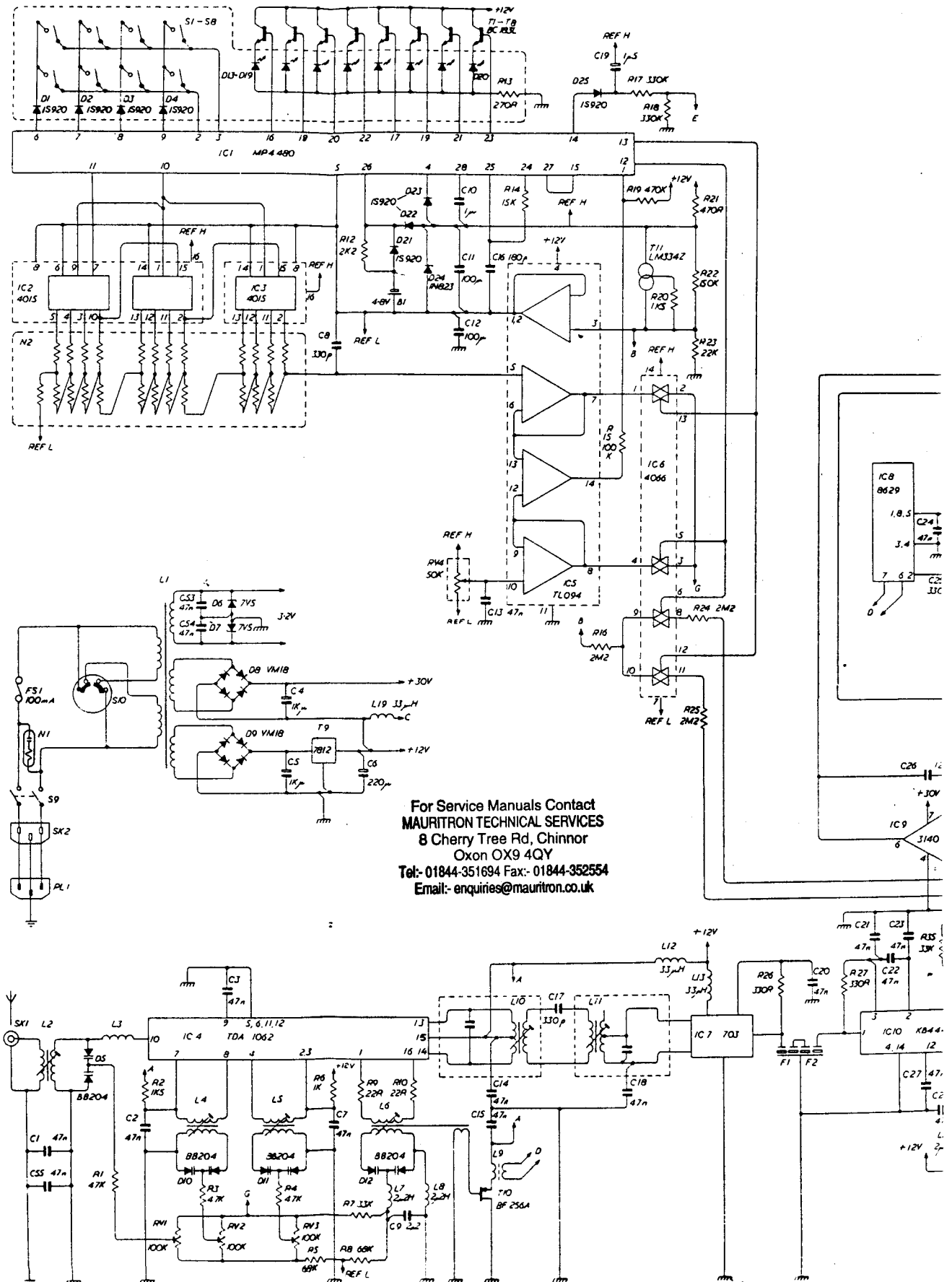
- |            |                          |                  |
|------------|--------------------------|------------------|
| <b>No.</b> | <b>Description</b>       | <b>Stock No.</b> |
| 1          | Screw M4 x 16 mm         | TM416PA          |
| 2          | Washer M4                | TDM4SPA          |
| 3          | Chassis Guide            | M12562A          |
| 4          | Cover                    | M12573A          |
| 5          | Foot                     | M12620A          |
| 6          | Screw M4 x 5 mm          | TM40SPA          |
| 7          | Non-Slip Pad             | AFN0SLA          |
| 8          | Screw 2.2 x 3/16         | TC205PF          |
| 9          | Fuse T63mA               | UM63MDA          |
| 10         | Voltage Selector Shroud  | M12579A          |
| 11         | Fuseholder               | PF5234A          |
| 12         | Mains Out - Socket       | FSR472A          |
| 13         | Mains Transformer Screen | M12571A          |
| 14         | Screw 4.2 x 1/4          | TC406PC          |
| 15         | Mains In - Plug          | PPR0331          |
| 16         | Warning Label            | M12663A          |
| 17         | Mains Transformer Cover  | M12572A          |
| 18         | Screw M3 x 6 mm          | TM306PA          |
| 19         | Washer M3                | TDM3SPA          |
| 20         | Soldertag                | FTB6SS5          |
| 21         | Nut M3                   | TM3PHPA          |
| 22         | Chassis                  | M12568A          |
| 23         | Mains Switch Link        | M12593A          |
| 24         | Link                     | N39159A          |
| 25         | Push-on-Fix              | FF123ZF          |
| 26         | Display Bracket          |                  |
| 27         | Display                  | DISPLAY          |
| 28         | Amber Filter             | M12611A          |
| 29         | Tuning Pot               | RVF4TUB          |
| 30         | Tuning Pot Bracket       | M12569A          |
| 31         | Dished Washer            | TD22010          |
| 32         | Spindle Lock             | N509816          |
| 33         | Screw M3 x 6 mm SS       | TM306PG          |
| 34         | Display Gasket           | M12717A          |
| 35         | Display Perspex          | M12576A          |
| 36         | Mains Switch Knob        | N36325A          |
| 37         | Crossscrew M3 x 16 mm    | TM316RC          |
| 38         | Tune Knob                | M12589A          |
| 39         | Front Panel              | M12560A          |
| 40         | LED Bezel                | M12710A          |
| 41         | Button Board Assembled   | TGSMAAA          |
| 42         | Brown PVC Strip          | FP70271          |
| 43         | W/ Button                | M12575A          |
| 44         | Safety Cover             |                  |
| 45         | PCB Assembled            | TC205PF          |
| 46         | Aerial Socket Screw      | PS01070          |
| 47         | Aerial Socket            |                  |
| 48         | 5 Pin DIN Socket         | PS05DNB          |

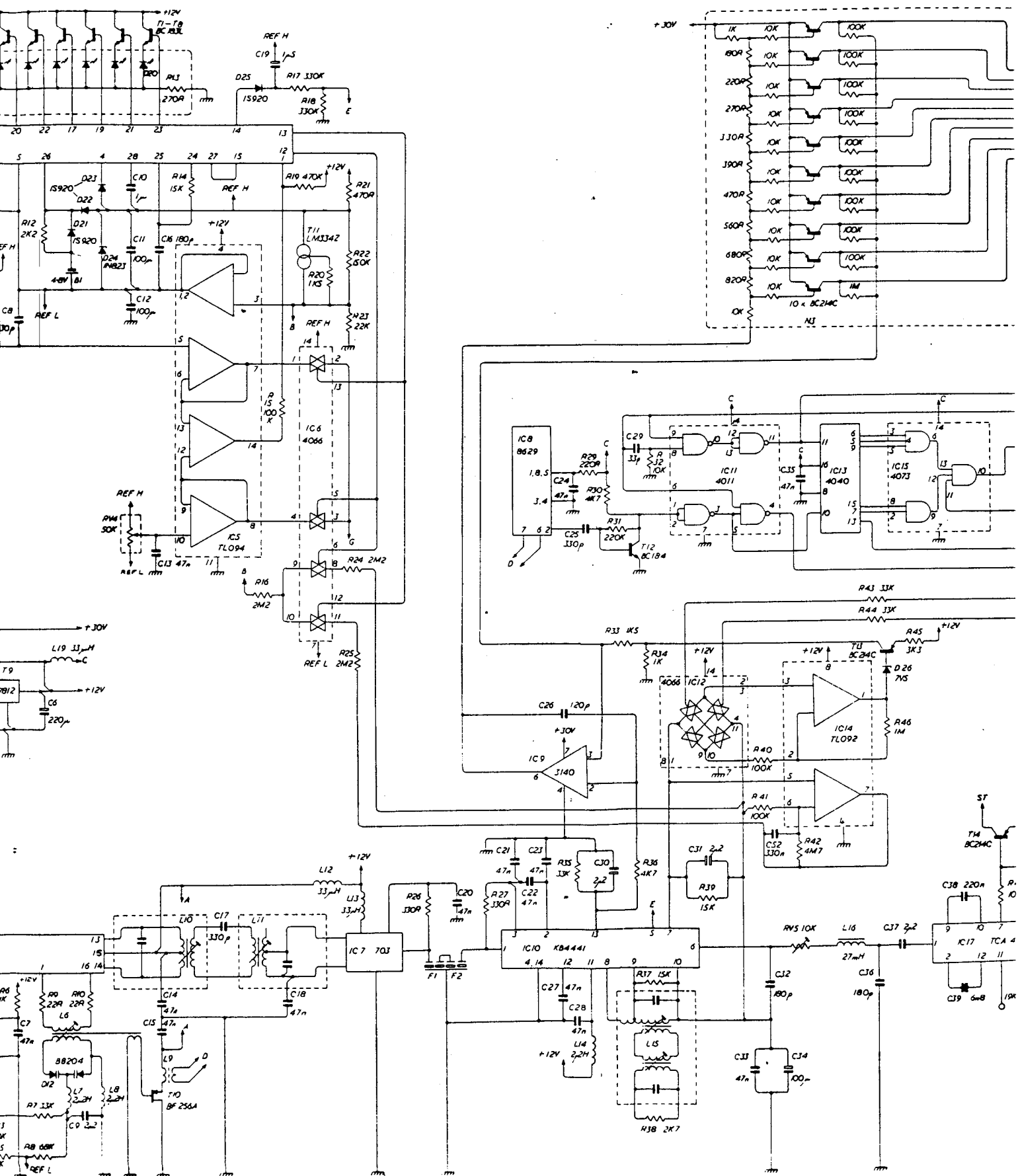
Fig. 8

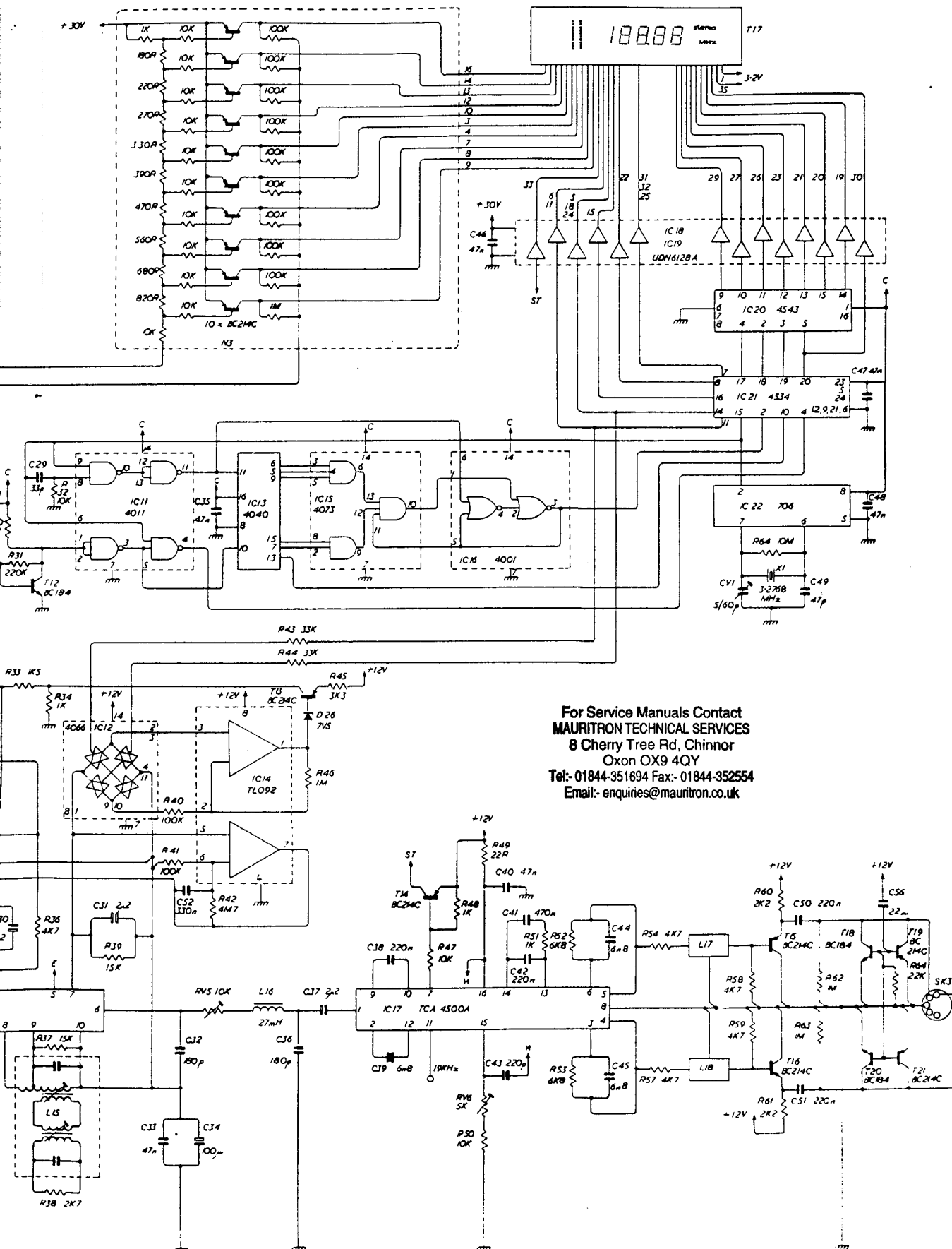
# circuit diagram

M12616 ISS 1

For use with Tuners up to approx Serial Number 2,000 PCB No. M12615 ISS 2





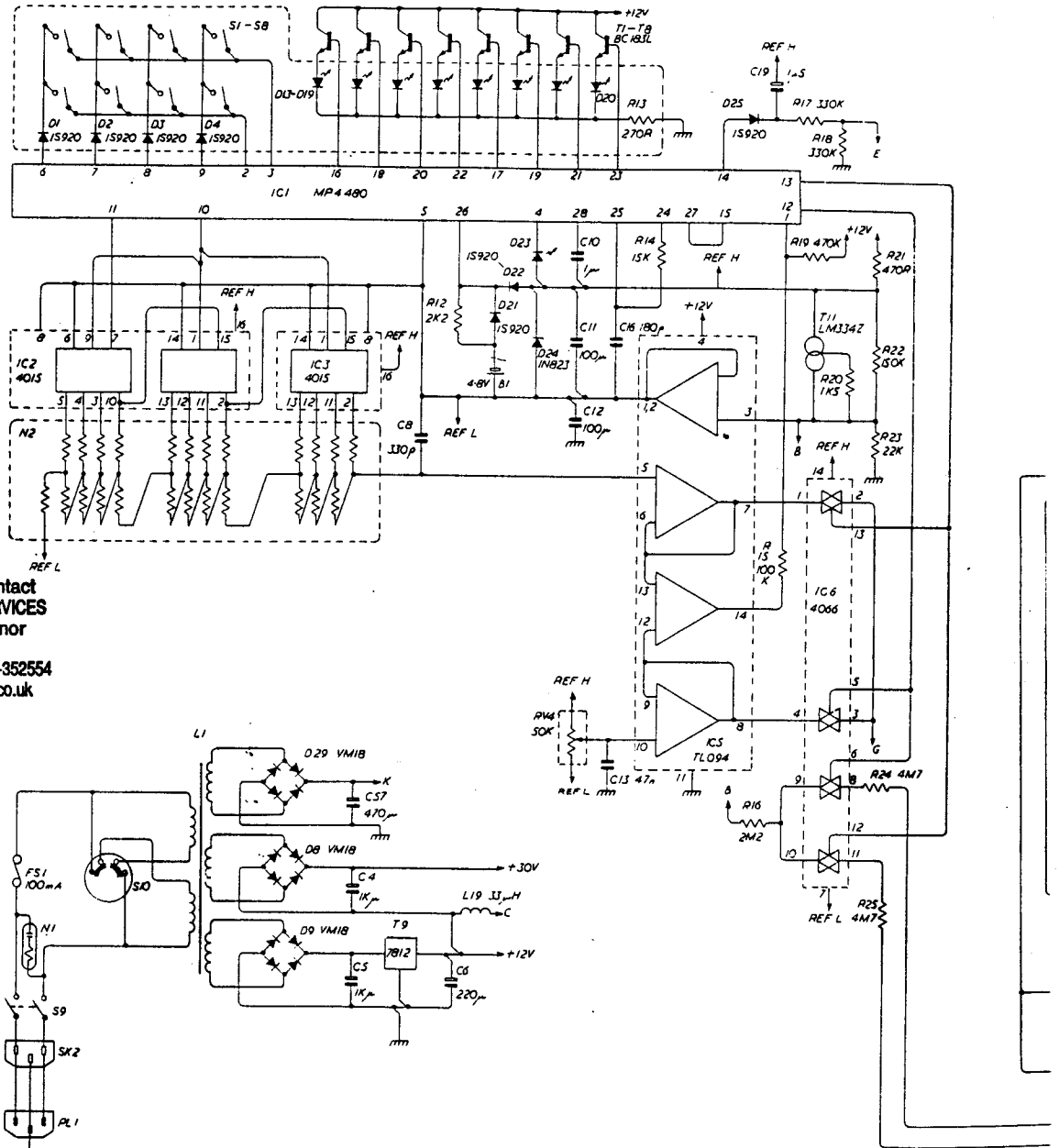


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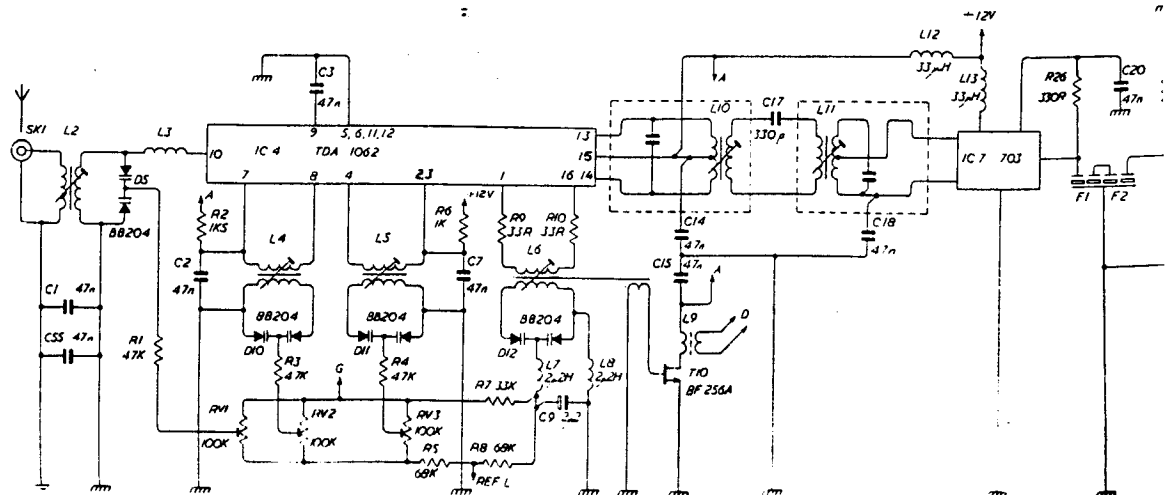
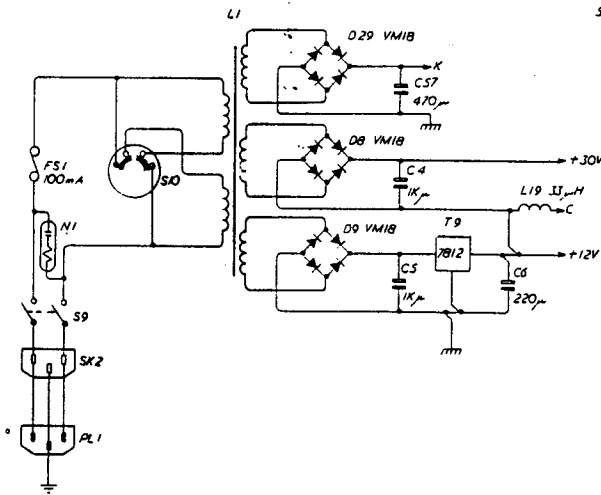
# circuit diagram

M12616 ISS 1(b)

For use with Tuners from approx Serial Number 2,000 to approx 2,500 PCB No M12615 ISS 3



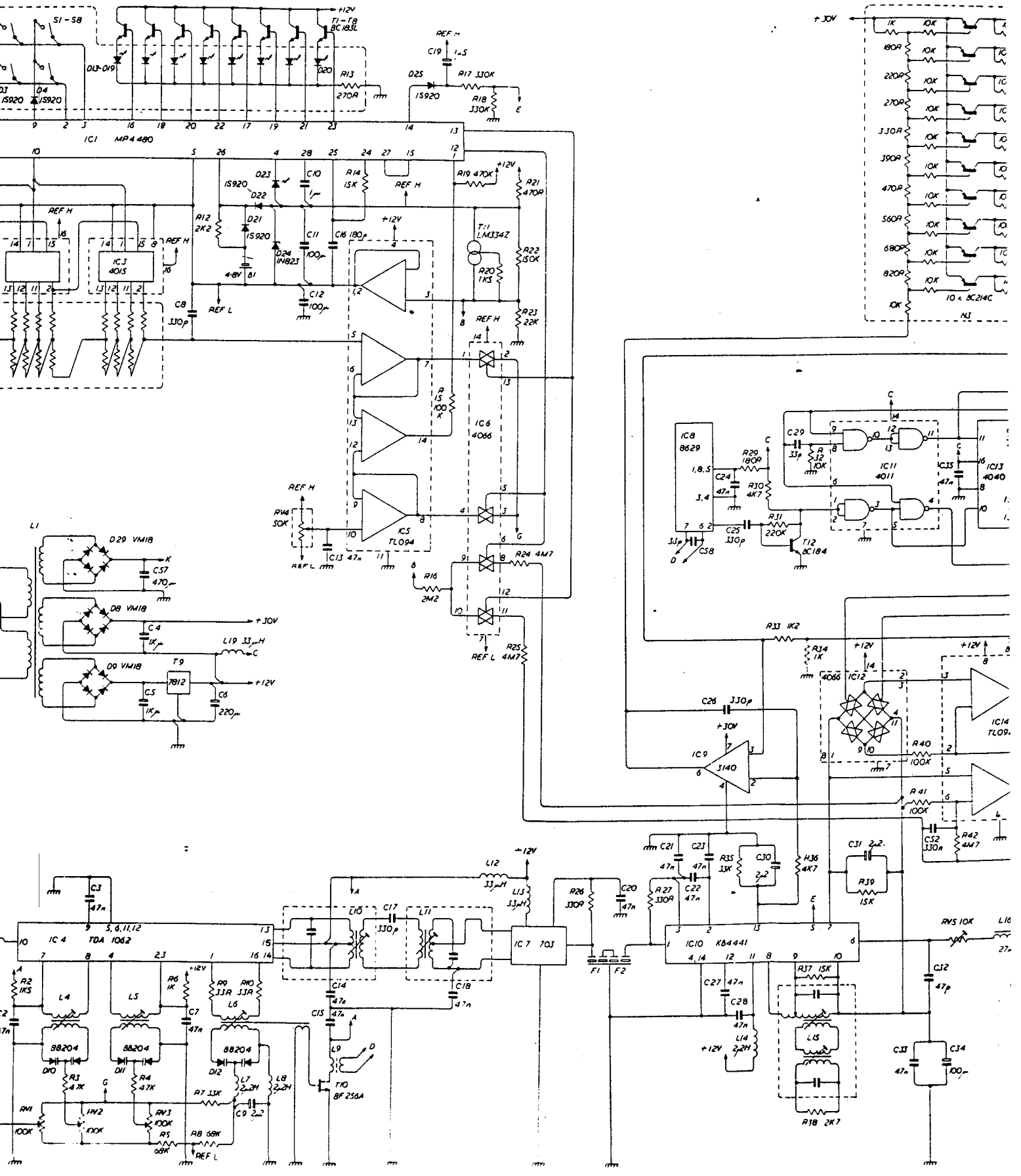
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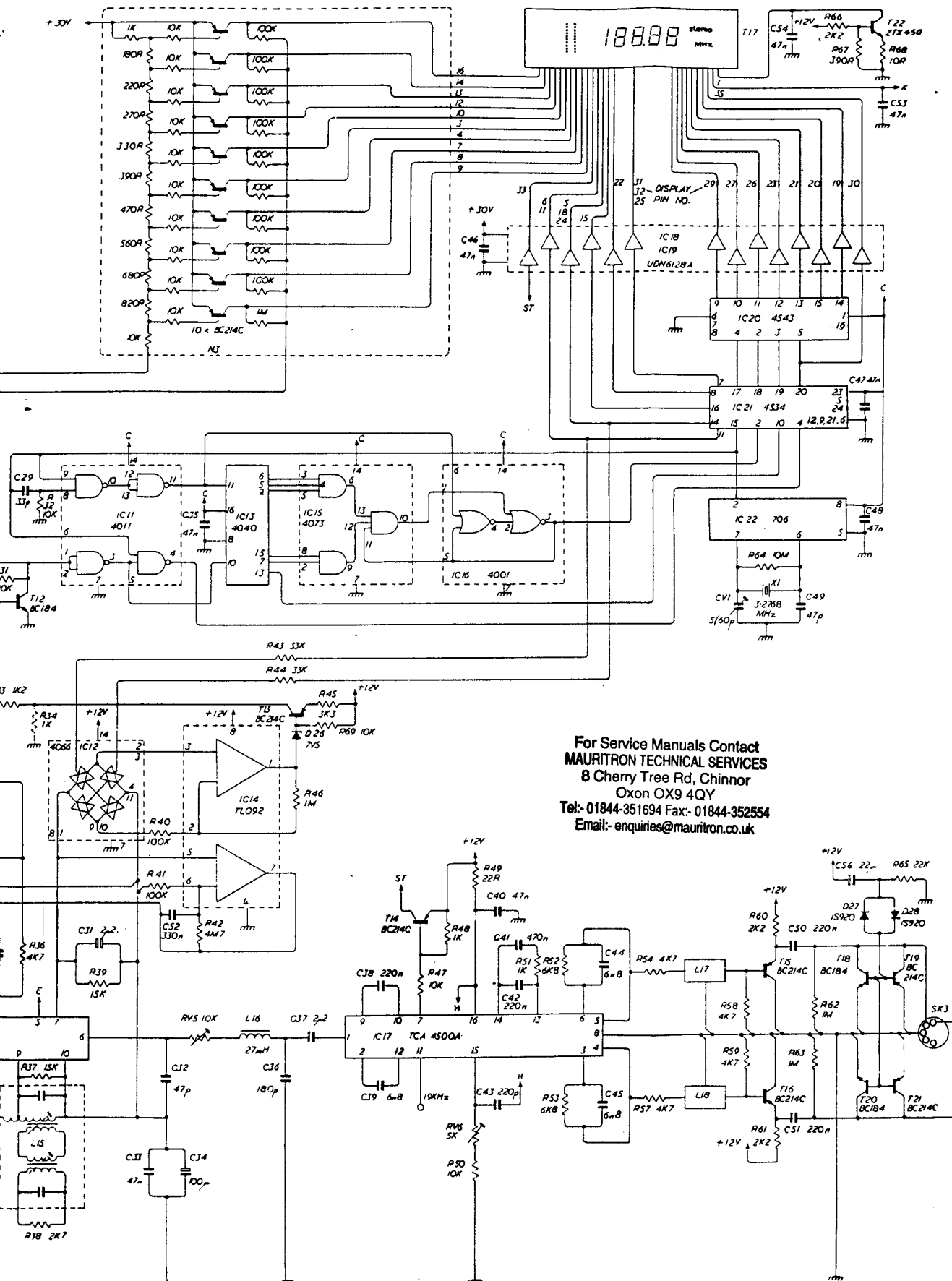
# diagram

1(b)

Owners from approx Serial Number 2,000 to approx 2,500 PCB No M12615 ISS 3



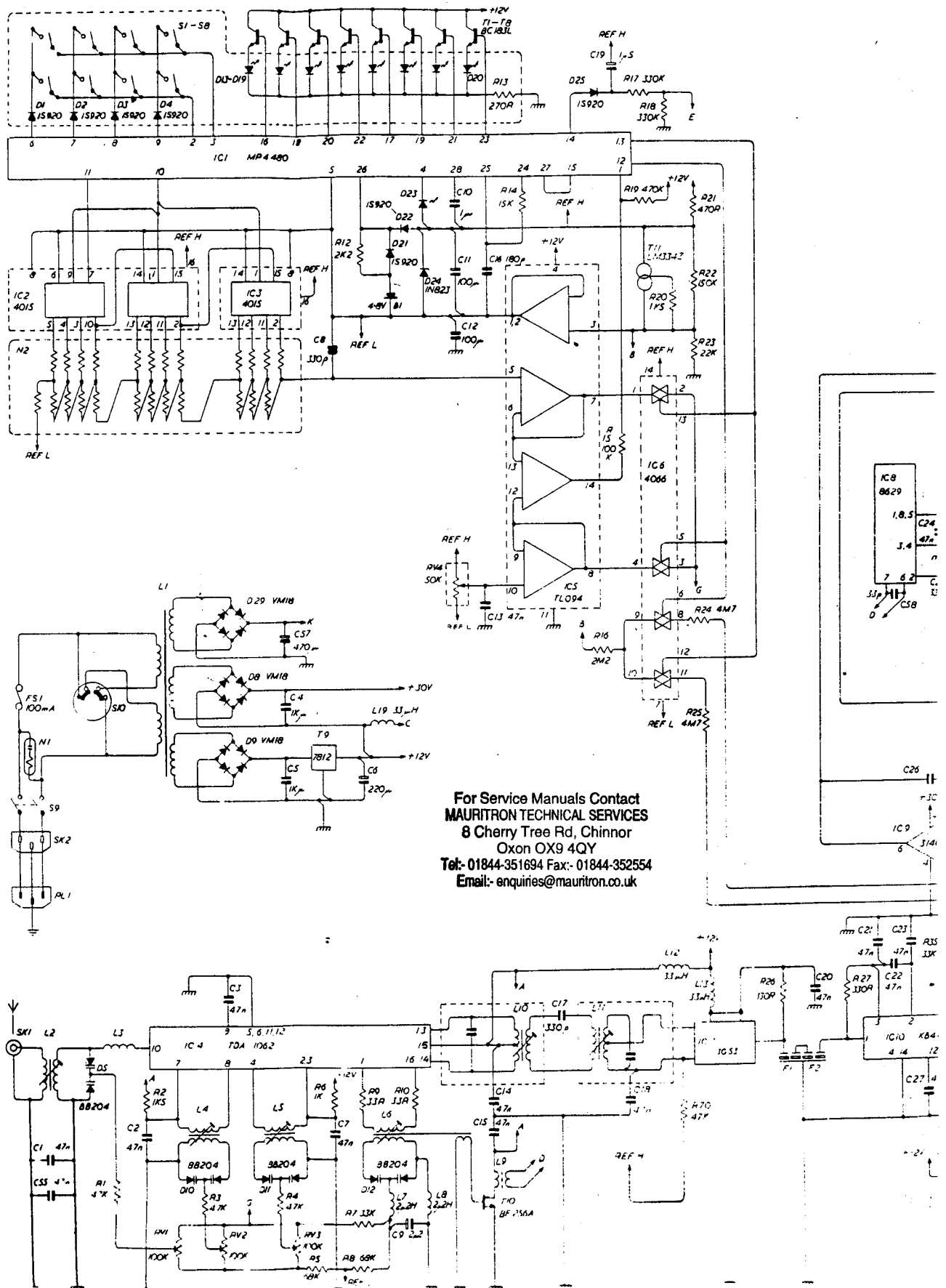




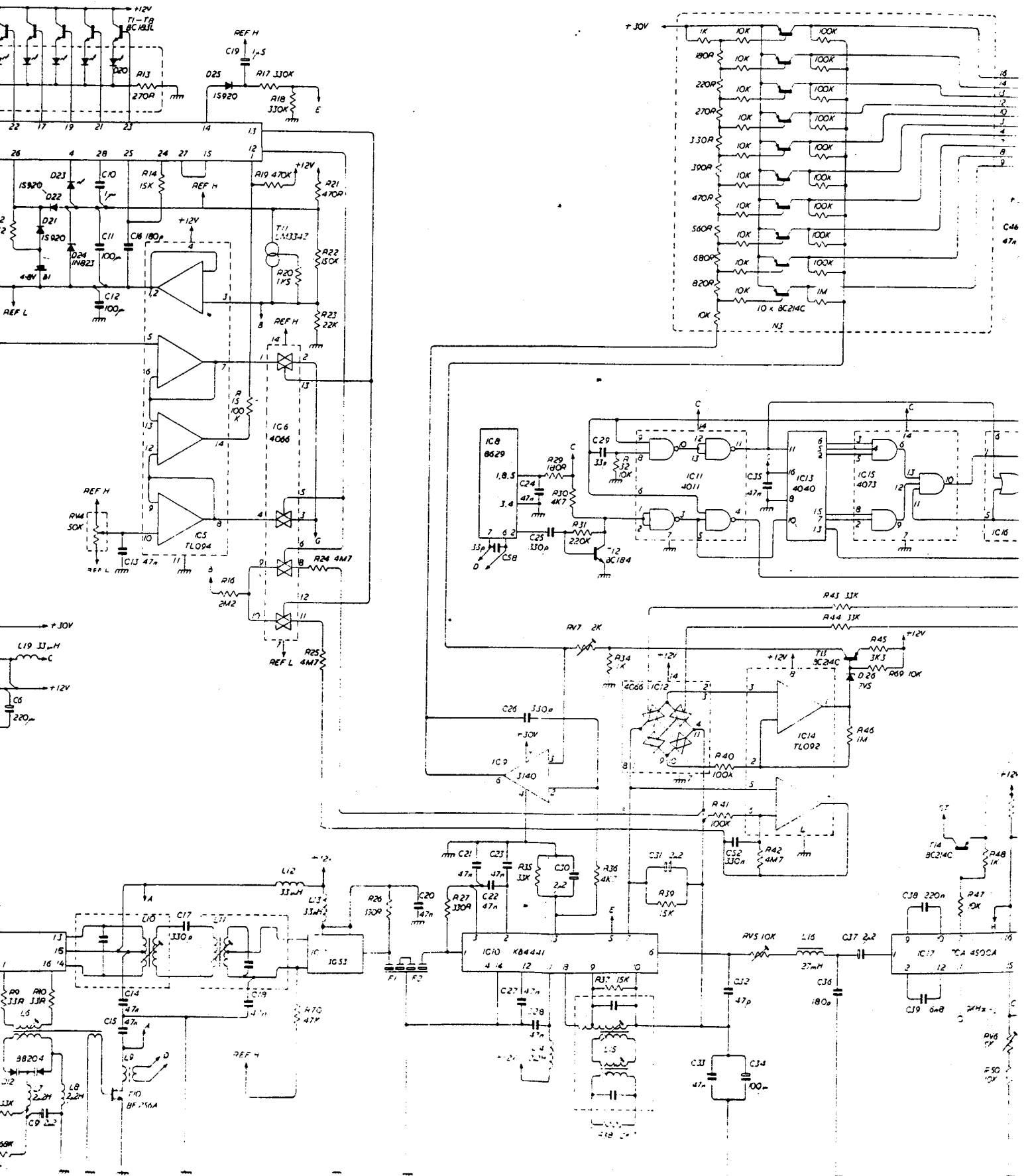
# circuit diagram

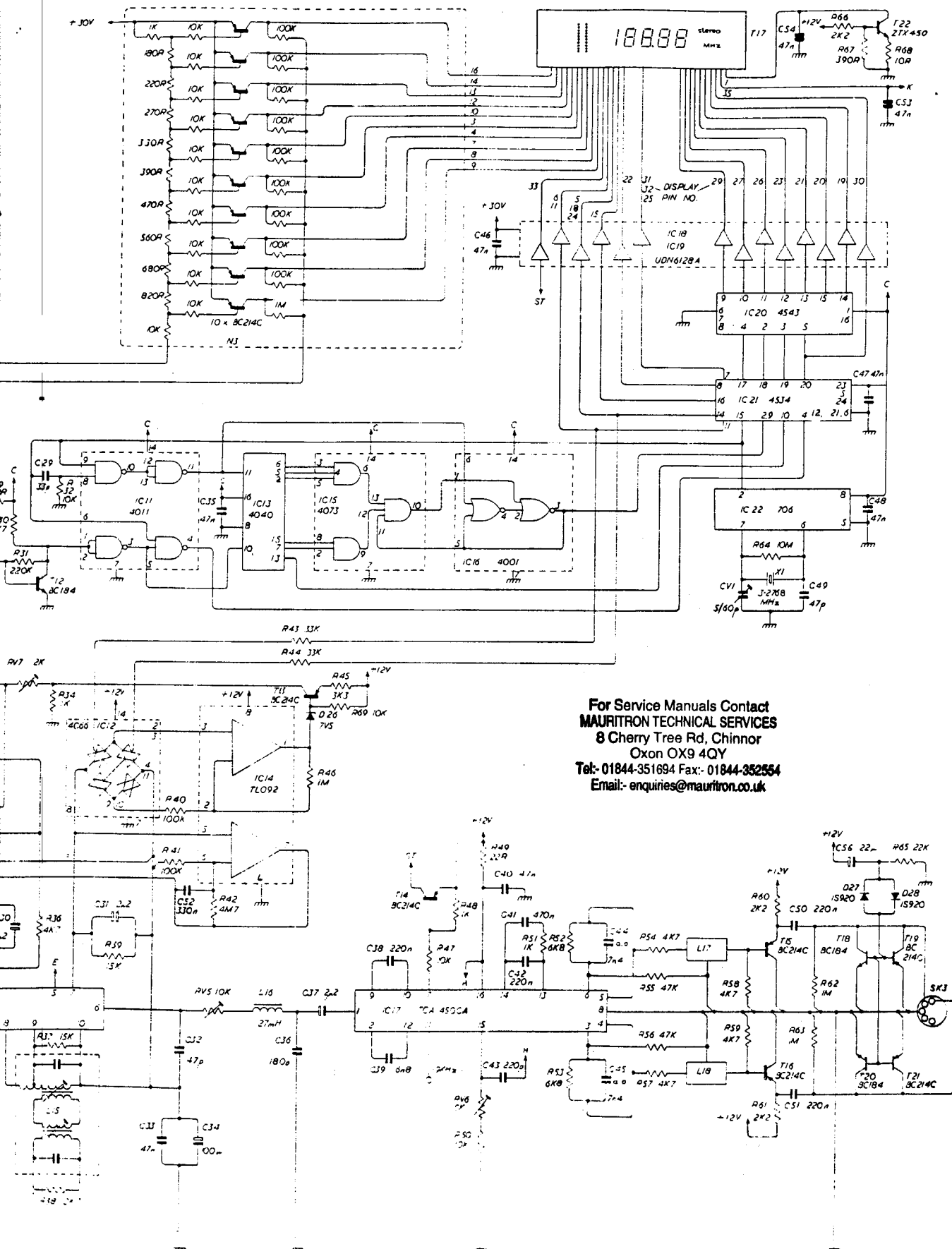
M12616 ISS 2

For use with Tuners from approx Serial Number 2,500 to 11,000 PCB No M12615 ISS 4



Number 2.500 to 11.000 PCB No M12615 ISS 4



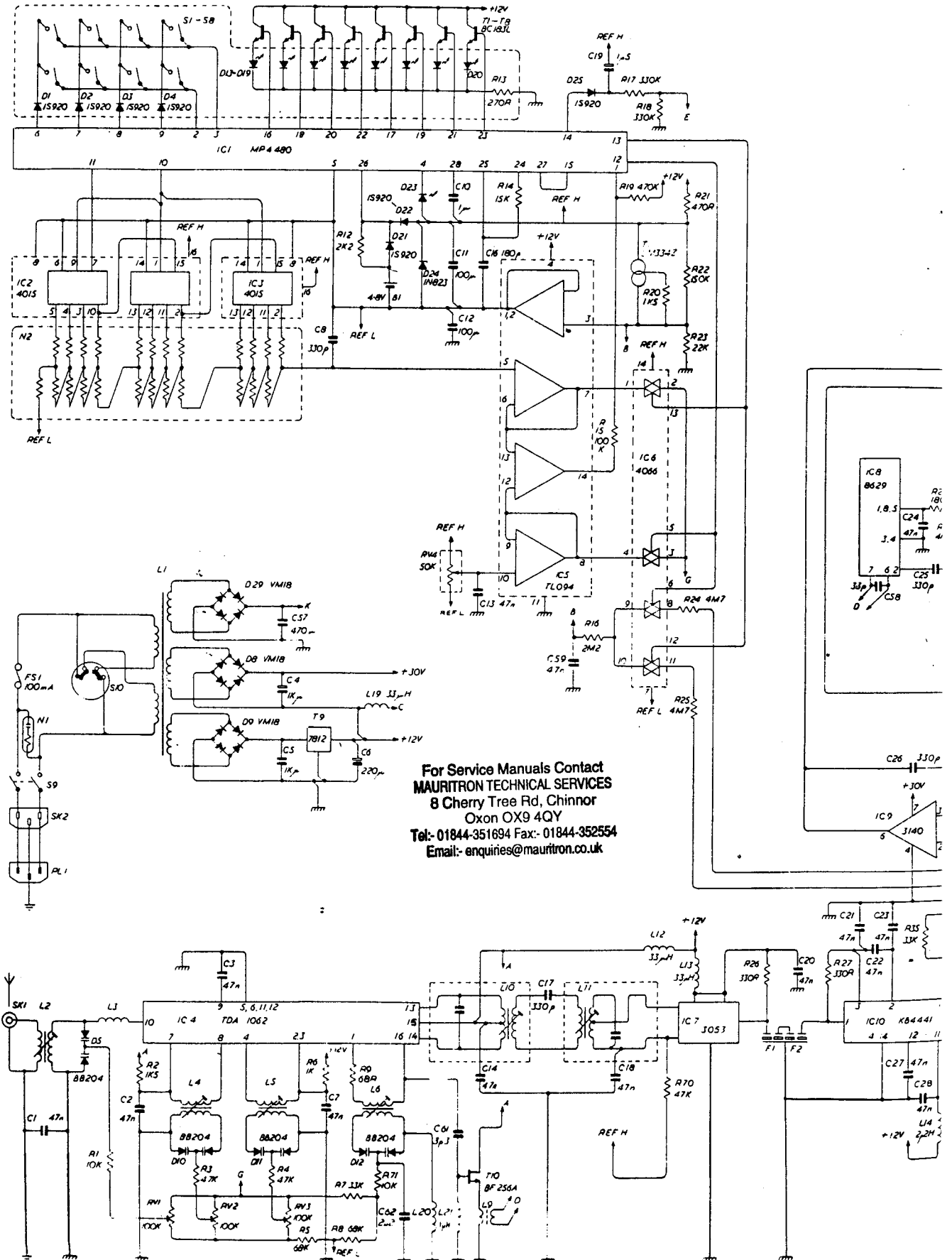


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# circuit diagram

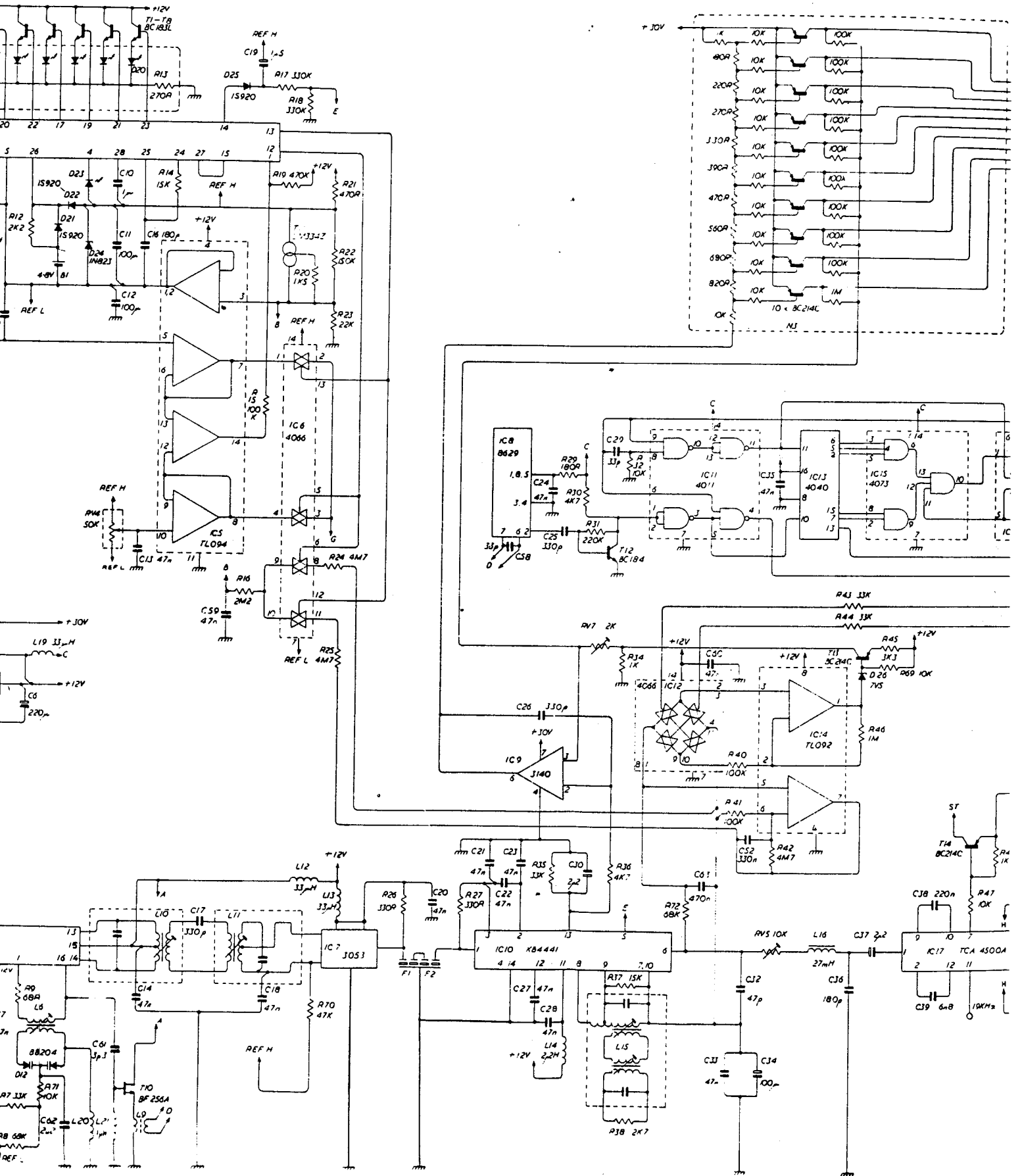
M12616 ISS 3

For use with Tuners from Serial Number 11,000 onwards PCB No M12615 ISS 5

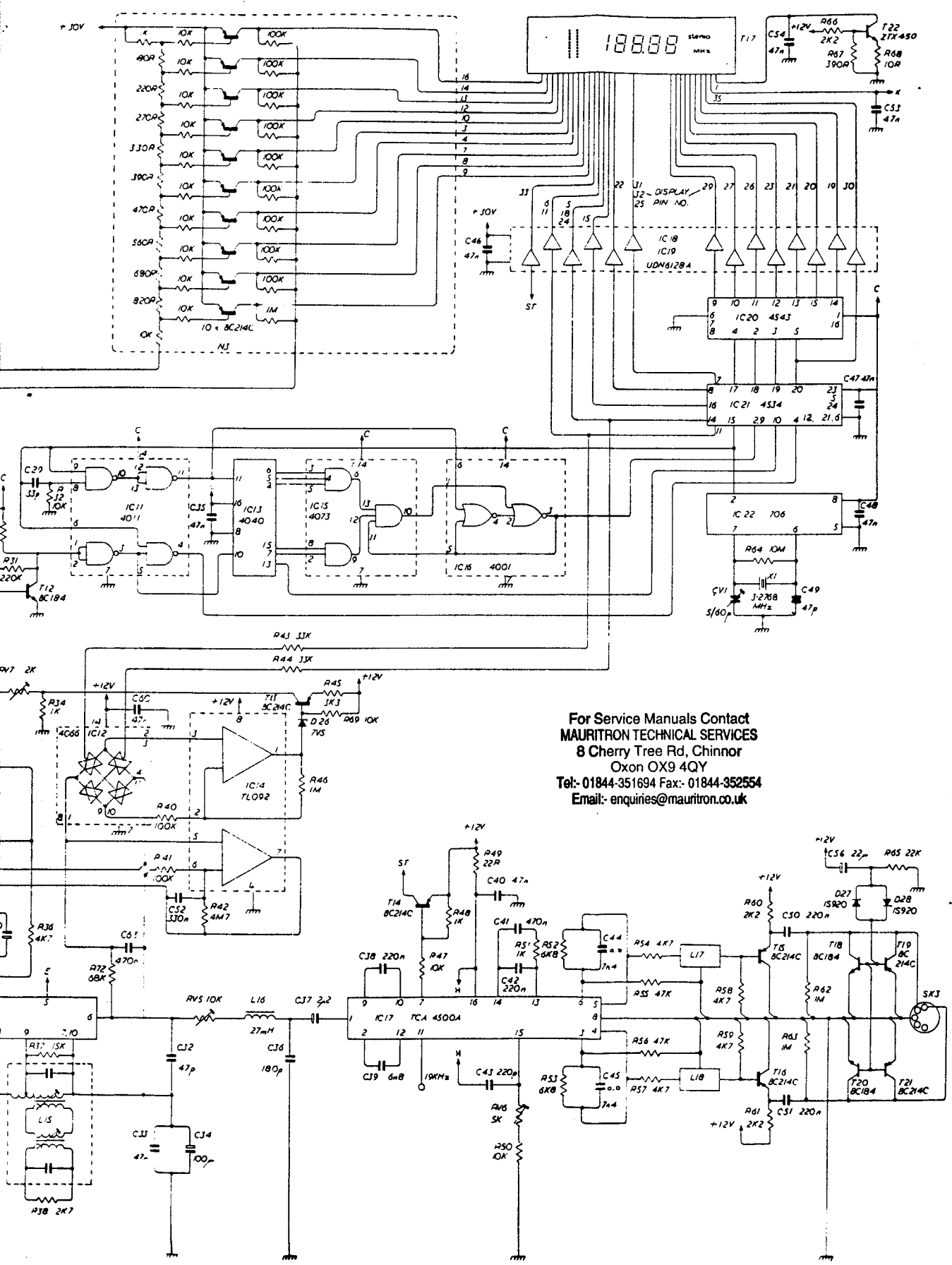


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er 11,000 onwards PCB No M12615 ISS 5



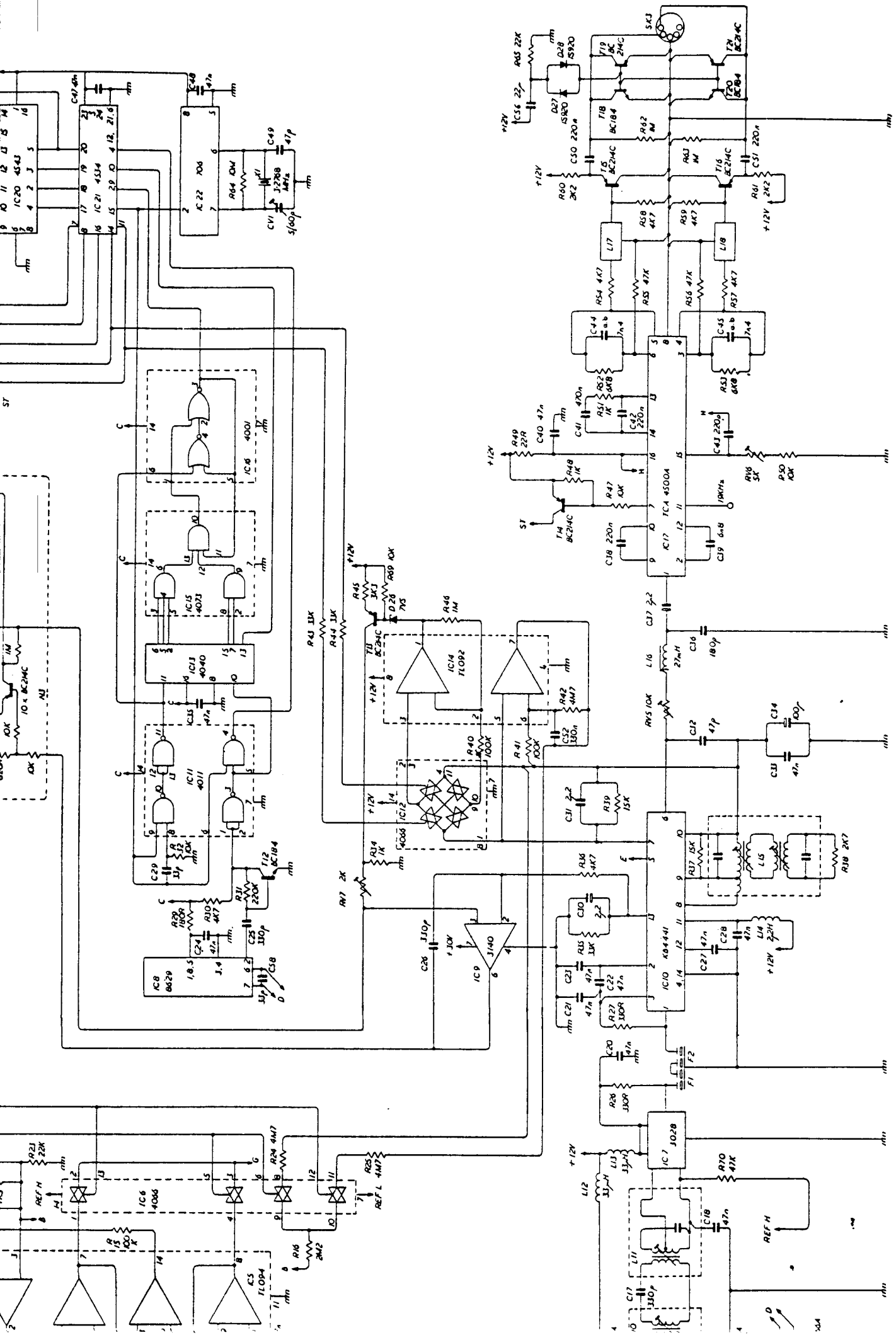
# QUAD FM4 Tuner service data

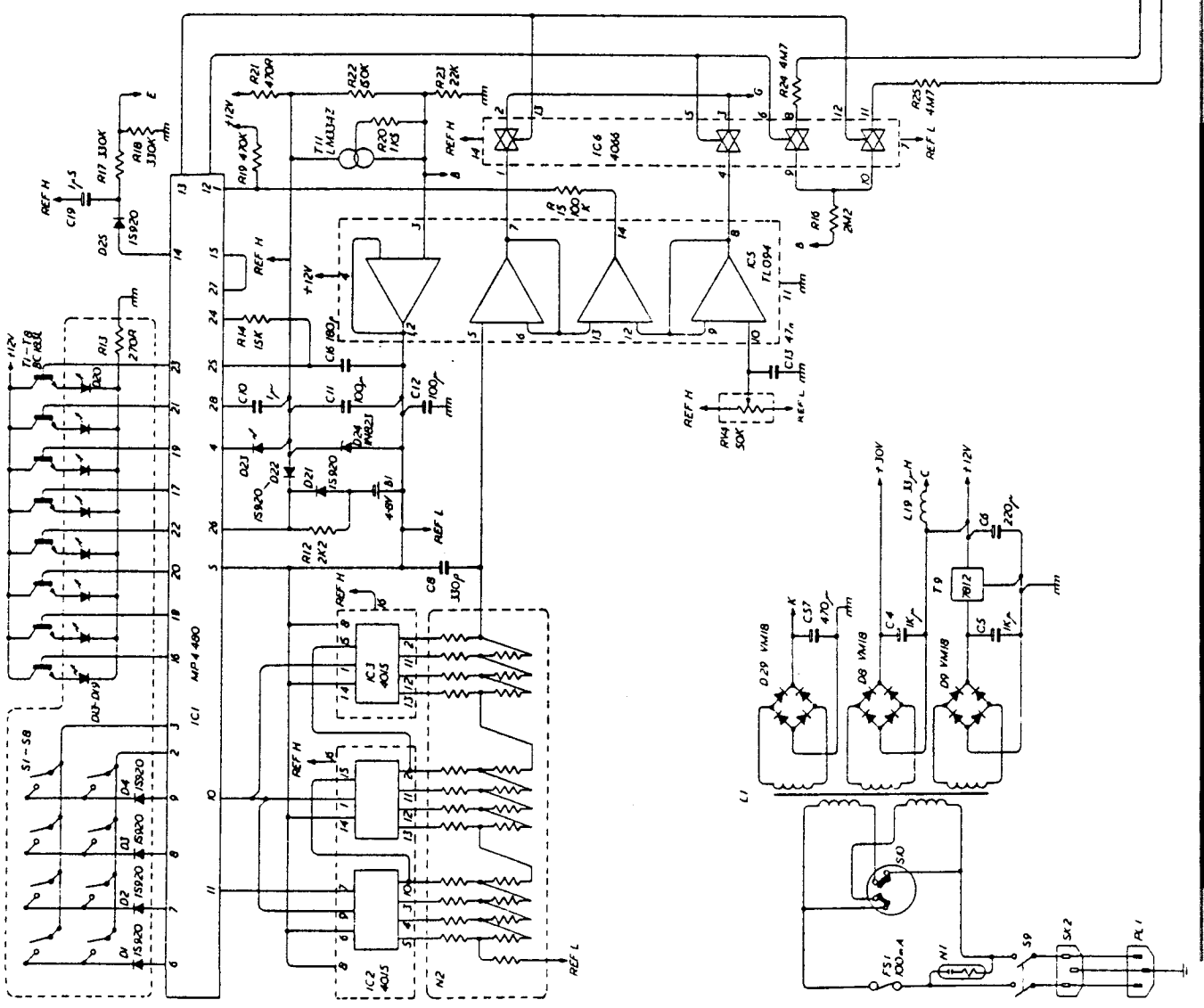
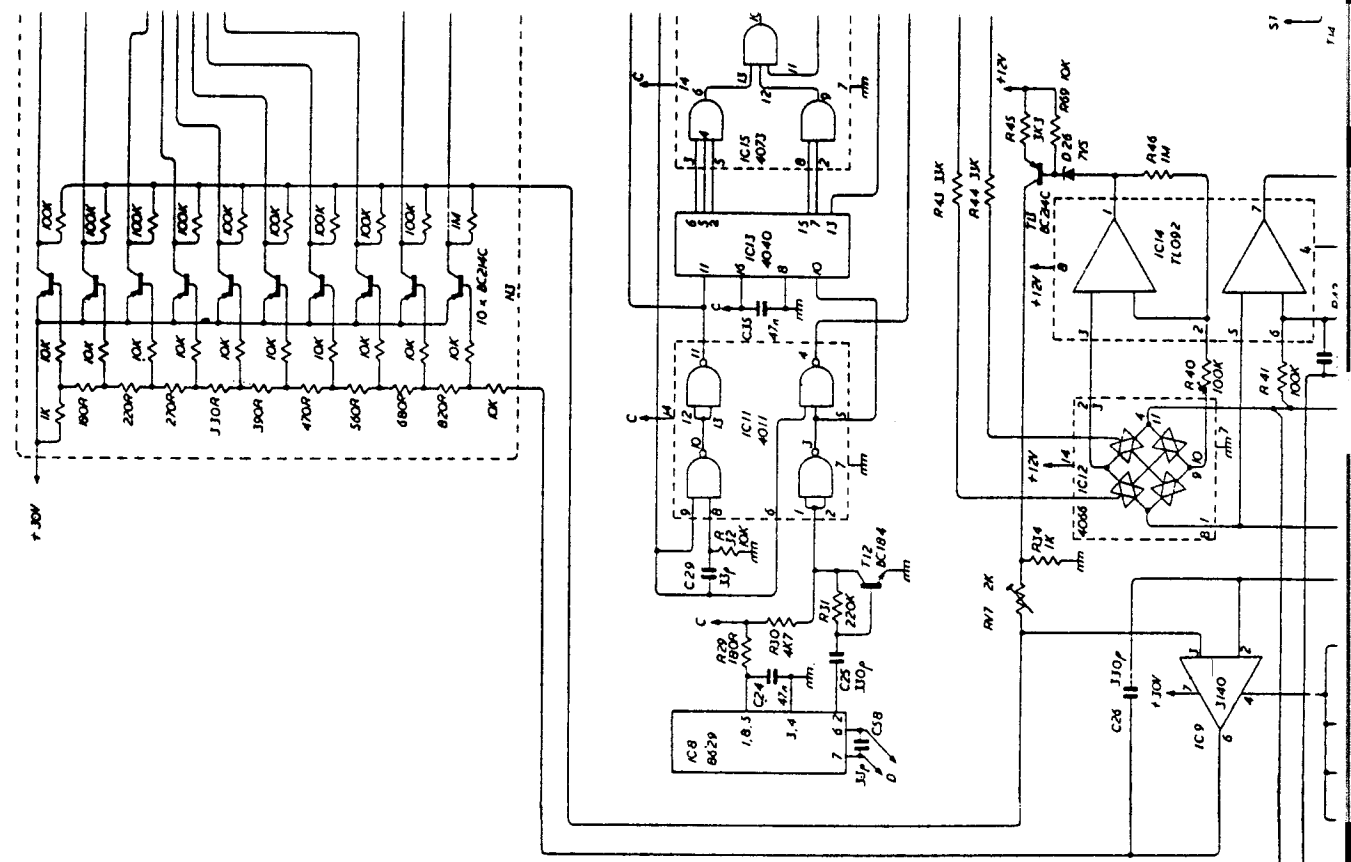


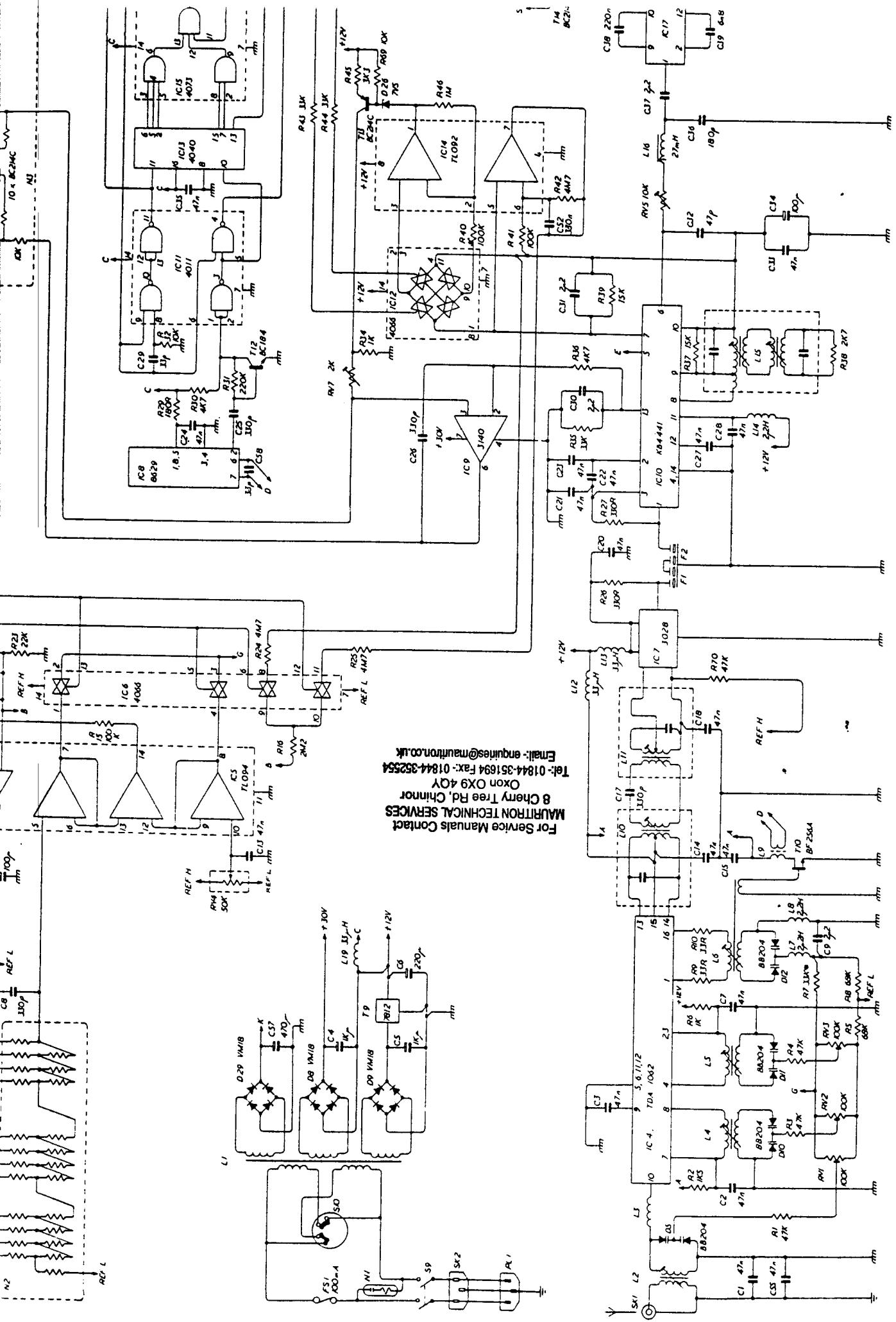
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